

Indo-Slavic lexical isoglosses and the
prehistoric dispersal of Indo-Iranian



Axel I. Palmér

Indo-Slavic lexical isoglosses and the prehistoric dispersal of Indo-Iranian

Indo-Slavic lexical isoglosses and the prehistoric dispersal of Indo-Iranian

Axel I. Palmér

PhD dissertation

Leiden University, The Netherlands

Copyright © 2024 Axel I. Palmér. All rights reserved.

Cover image: ink painting by Carmen Sylvia Spiers.

This research was funded by the Dutch Research Council (Nederlandse Organisatie voor Wetenschappelijk Onderzoek, NWO) under the research programme PhDs in the Humanities (grant number PGW.19.022).

Indo-Slavic lexical isoglosses and the prehistoric dispersal of Indo-Iranian

Proefschrift

ter verkrijging van
de graad van doctor aan de Universiteit Leiden,
op gezag van rector magnificus prof.dr.ir. H. Bijl,
volgens besluit van het college voor promoties
te verdedigen op dinsdag 2 juli 2024
klokke 11:15 uur

door

Axel Ingemar Palmér
geboren te Uppsala (Zweden)
in 1994

Promotores: Prof.dr. G.J. Kroonen
Prof.dr. A.M. Lubotsky

Promotiecommissie: Dr. A. Korn (CNRS, Paris)
Prof.dr. M.J. Kümmel (Universität Jena)
Dr. T.C. Pronk
Prof.dr. J. Schaeken

Dedicated to

Edvard Selander Patrignani

*11 April 1994 †18 July 2022

Acknowledgements

This work concludes four and a half years as a PhD candidate at Leiden University Centre for Linguistics. It would not have been possible without the supervision and guidance – from writing the research proposal to submitting this dissertation – by Guus Kroonen and Sasha Lubotsky, to whom I am eternally grateful. Thank you for inspiring me with your knowledge, expertise, and curiosity to think outside the box and broaden my horizons.

The journey toward the PhD started in the final year of my MA at Leiden University. I thank Kate Bellamy for encouraging me to apply for funding with NWO. Thanks also to Marian Klammer, Owen Edwards, Hanna Fricke, Zoi Gialitaki, Gereon Kaiping, Francesca Moro, George Saad, Yunus Sulistyono, Eline Visser, Jiang Wu, and Nurenzia Yannuar for helping me improve my research proposal and my interview skills.

I wish to thank my teachers and colleagues at LUCL for always being willing to discuss questions and problems regarding research, teaching, and other matters. I feel very fortunate to have had the opportunity to work with you. A special thank you goes to the colleagues of the EUROLITHIC project. I have enjoyed our collaboration immensely. To my fellow PhD students and postdocs at LUCL – especially Andrew Wigman, Anthony Jakob, Cid Swanenvleugel, Paulus van Sluis, Rasmus Thorsø, Abel Warries, Louise Friis, Niels Schoubben, Stefan Norbruis, Carmen Spiers, Xander Vertegaal, Federico Dragoni, Jesse Wichers-Schreur, Tobias Søbørg, Lis Kerr, Sophia Nauta, Jiang Wu, Ahmed Sosal, Bente de Graeve, Hester Groot, Olga Nozdracheva, Saskia Dunn, and Natasja Delbar – thank you for all the great discussions and good times that made these years so much more enjoyable.

Two highlights during my time as a PhD candidate were my research stays abroad. I am very grateful to the colleagues at the Research unit of Archaeology in Helsinki, especially Volker Heyd and Asko Parpola, for inviting me and teaching me so much about European and Asian prehistory. I would likewise like to extend a warm thank you to the colleagues at the David Reich Lab at Harvard University, especially to David Reich, Nick Patterson, Ali Akhbari, Iosif Lazaridis, and Tian Chen Zeng, for taking an interest in my research and challenging me to develop new ideas, and to Roslyn Curry, Daniel Tabin, Jeremy Choin, and Eveline Altena for making me feel so welcome during my time in Cambridge.

I would also like to thank my teachers and friends at Uppsala and Stockholm Universities, especially Christiane Schaeffer, Oscar Billing, Jenny Larsson, and Anders Jørgensen, for staying closely in touch during my years in the Netherlands.

Last but not least, my gratitude goes to my friends in the Netherlands, Sweden, and elsewhere, and to my dear parents Anne and Kjell. Thank you for all your love and support throughout the years.

Table of contents

List of tables and figures	xx
Tables	xx
Figures	xx
List of abbreviations	xxi
General	xxi
Symbols	xxii
Languages	xxii
1. Introduction	1
1.1. Preliminaries: historical linguistics and the study of human prehistory	1
1.2. Aim of the thesis	2
1.3. State of the art: the position of Indo-Iranian within the Indo-European language family	2
1.4. Research questions	14
2. Theory and methodology	15
2.1. Introduction	15
2.2. Phylogenetic subgrouping	15
2.2.1. The shared innovation principle	16
2.2.2. Typology of shared innovations	18
2.2.3. Lexical characters as evidence for subgrouping	18
2.2.4. Quantity of shared innovations in subgrouping	22
2.2.5. The Indo-Iranian bias	23
2.3. Dialectal subgrouping	24
2.4. Hybrid models	31
2.5. Linguistic palaeontology	35
3. Lexical isoglosses shared by Indo-Iranian and Balto-Slavic	39
3.1. Introduction	39
3.2. Isoglosses: plausible shared innovations	41
3.2.1. <i>*ǵ^hos-to-</i> ‘hand’	41
3.2.2. <i>*h₂eǵ-</i> ‘goat’	42
3.2.3. <i>*h₂eǵ-ino-</i> ‘animal skin, leather’	44
3.2.4. <i>*neih₁-</i> ‘to churn’	45
3.2.5. <i>*som</i> ‘together, with’	47
3.3. Isoglosses: possible shared innovations	49
3.3.1. <i>*b^(h)e</i> , <i>*b^(h)eǵ^h</i> ‘outside, without’	49
3.3.2. <i>*b^hrod^h-no-</i> ‘a (pale) horse colour’	50
3.3.3. <i>*b^hud^h-ro-</i> ‘attentive, awake’	50
3.3.4. <i>*d^heh₁i-nu-</i> ‘female mammal’	51
3.3.5. <i>*d^hemH-</i> / <i>*d^hmeH-</i> ‘to blow’	52
3.3.6. <i>*d^hoH-neh₂-</i> ‘grains’	52
3.3.7. <i>*d^hor-eie/o-</i> ‘to hold, support’	53

3.3.8.	* <i>ǵelp-</i> ‘to murmur, babble’	54
3.3.9.	* <i>ǵuelH-e/o-</i> ‘to burn, shine’	54
3.3.10.	* <i>ǵ^heuH-e/o-</i> ‘to call, curse’	55
3.3.11.	* <i>ǵ^houH-o-</i> ‘call, invocation’	56
3.3.12.	* <i>ǵ^huel-</i> ‘to be bent, walk crookedly’	56
3.3.13.	* <i>g^(w)eHi-</i> ‘to sing’	57
3.3.14.	* <i>g^woih₃-o-</i> ‘life’	58
3.3.15.	* <i>g^(wh)eh₂ǵ^h-</i> ‘to wade’	59
3.3.16.	* <i>g^(wh)eld^h-</i> ‘to be greedy, desire’	60
3.3.17.	* <i>HoustHo-</i> ‘lip’	61
3.3.18.	* <i>h₁ong^(w)-l-</i> ‘coal’	62
3.3.19.	* <i>h₁su-dru-</i> ‘made of good wood’	62
3.3.20.	* <i>h₁uk-ie/o-</i> ‘to be(come) accustomed to’	63
3.3.21.	* <i>h₂eu-r-eh₁</i> adv. ‘(over) there, downwards’	64
3.3.22.	* <i>h₃ieb^h-e/o-</i> ‘to copulate’	65
3.3.23.	* <i>ǵ^heuH-</i> ‘to throw, shove, shoot’	66
3.3.24.	* <i>ǵ^hieh₁-mo-</i> ‘black, dark, grey’	67
3.3.25.	* <i>ǵ^hleu-os-</i> ‘word’	68
3.3.26.	* <i>ǵ^hop-o-</i> ‘straw (carried by water)’	68
3.3.27.	* <i>ǵ^huen-to-</i> ‘holy, sacred’	69
3.3.28.	* <i>ǵ^huoit-ó-</i> ‘white, bright’	70
3.3.29.	* <i>k(o)rt-</i> ‘(one) time(s)’	72
3.3.30.	* <i>krs-no-</i> ‘black’	73
3.3.31.	* <i>kseud-</i> ‘to make small; to spray’	74
3.3.32.	* <i>k^wer-</i> ‘to perform magic’	74
3.3.33.	* <i>mentH-eh₁-</i> ‘(wooden) tool for stirring’	75
3.3.34.	* <i>miǵ-ro-</i> ‘mixed’	76
3.3.35.	* <i>mosg^h-en-</i> ‘brain, marrow’	77
3.3.36.	* <i>ne</i> ‘as, like’	78
3.3.37.	* <i>ni-h₃(e)k^w-</i> adj. ‘facing downwards’	79
3.3.38.	* <i>nog^w-o-</i> ‘naked’	80
3.3.39.	* <i>peh₂gs-ó-</i> ‘(body part) having a side’	81
3.3.40.	* <i>peh₃i-men-</i> ‘milk’	82
3.3.41.	* <i>pelH-ou-</i> ‘chaff’	83
3.3.42.	* <i>seng-</i> ‘to attach, fasten’	83
3.3.43.	* <i>seuk-</i> ‘to turn, twist; to churn’	85
3.3.44.	* <i>som-d^heh₁-</i> ‘agreement’	86
3.3.45.	* <i>suleh₂-</i> ‘juice; milk’	87
3.3.46.	* <i>tsprh_{2/3}-e/o-</i> ‘to kick away with the foot’	88
3.3.47.	* <i>tusk-io-</i> ‘empty’	89
3.3.48.	* <i>uert-men-</i> ‘course’	91
3.3.49.	* <i>uolk-o-</i> ‘hair’	91

3.3.50.	*uolo- ‘tail hair (of horse)’	92
3.4.	Uncertain isoglosses.....	92
3.4.1.	*b ^h erH-men- ‘support; burden’	92
3.4.2.	*b ^h reh ₁ ǵ- ‘to shine, dawn’	93
3.4.3.	*b ^h uHs- ‘to be active, strengthen’	94
3.4.4.	*b ^h uh ₂ -r(i)- ‘much, plenty’	94
3.4.5.	*-di- 3 rd person encl. pron.	95
3.4.6.	*d ^h (o)r-uo- ‘firm, healthy’	96
3.4.7.	*ǵemb ^h - ‘to suffer from cold’	97
3.4.8.	*ǵ ^h elh ₃ -en- ‘green, yellow, gold’	98
3.4.9.	*ǵ ^(h) (u)rstuo/eh ₂ - ‘stone, gravel, sand’	99
3.4.10.	*g ^w rh ₃ -e/o- ‘to devour, swallow’	100
3.4.11.	*Huep- ‘to call’	101
3.4.12.	*h ₁ ēd / *h ₁ ōd adv. ‘then, and, so’	102
3.4.13.	*h ₁ iti adv. ‘so, in this manner’	103
3.4.14.	*h ₂ eid ^h -smo- ‘firewood’	103
3.4.15.	*h ₂ sus-ko- ‘dry’	104
3.4.16.	*h ₂ ueh ₁ -iu- ‘wind’	105
3.4.17.	*ieh ₂ - ‘to drive’	105
3.4.18.	*keh ₁ k ^(w) -o/eh ₂ - ‘green edible plant’	106
3.4.19.	*kei- ‘to be orphaned’	106
3.4.20.	*kolH-to- ‘cold’	107
3.4.21.	*keh ₂ -mo- ‘desire’	108
3.4.22.	*kenH- ‘to dig’	108
3.4.23.	*k ^(w) er ^k - ‘to become lean, emaciate’	109
3.4.24.	*k ^(w) leik ^k - ‘to torment’	110
3.4.25.	*k ^(w) o(n)Hd- ‘to bite’	110
3.4.26.	*k ^w (o)r-no- ‘deaf, with mutilated ears’	112
3.4.27.	*med ^h u-h ₁ ed- ‘honey-eater’	113
3.4.28.	*m(e)itH-u- ‘opposed’	114
3.4.29.	*nis-tio- adj. ‘(being) outside’	115
3.4.30.	*pr(H)k ^k - ‘rib, side, flank, chest’	115
3.4.31.	*(s)ker-men- ‘hide, skin’	116
3.4.32.	*sm-b ^h eh ₂ - ‘assembly, social gathering, meeting, company’	117
3.4.33.	*sor(H)-to- ‘red(-faced)’	118
3.4.34.	*srom-o- ‘lame’	118
3.4.35.	*telp- ‘to make room’	119
3.4.36.	*t(H)ong ^h -eie/o- ‘to pull’	119
3.4.37.	*(t)plh ₁ - ‘fort’	120
3.4.38.	*uelk ^(w) - ‘to pull, drag’	121
3.4.39.	*u(e)nH- ‘forest’	122
3.4.40.	*uik ^k -poti- ‘lord of the settlement’	122

3.4.41.	<i>*uisu(-)</i> ‘in every direction’	123
3.4.42.	<i>*ulp-i-</i> ‘(wild)cat’	124
3.5.	Rejected isoglosses	124
3.5.1.	<i>*b^hag-o-</i> ‘god’	124
3.5.2.	<i>*b^heb^hr-u-</i> ‘beaver’	125
3.5.3.	<i>*b^heHg^h-</i> ‘to press, stick’	126
3.5.4.	<i>*b^heh₂d^h-</i> ‘to push, press’	126
3.5.5.	<i>*b^hoh₂u-eie/o-</i> ‘to cause to be, linger (?)’	128
3.5.6.	<i>*b^h(o)lg^{(w)h}-</i> ‘good; a deity (?)’	128
3.5.7.	<i>*b^hong-o/eh₂-</i> ‘wave’	128
3.5.8.	<i>*b^houd^h-eie/o-</i> ‘to make awaken’	129
3.5.9.	<i>*b^hruH-no- / *b^hrouH-neh₂-</i> ‘embryo; scale’	129
3.5.10.	<i>*dekm-t-</i> ‘decade’	130
3.5.11.	<i>*deks(i)-no-</i> ‘right’	131
3.5.12.	<i>*dlh₁g^h-ó-</i> ‘long’	132
3.5.13.	<i>*drǵ^h-</i> ‘fetter; belt, strap, girdle’	132
3.5.14.	<i>*dr(H)-ueh₂-</i> ‘wild grass (?)’	133
3.5.15.	<i>*d^he-d^hh₁-</i> ‘(sour) milk’	133
3.5.16.	<i>*d^heg^{wh}-e/o-</i> ‘to burn’	134
3.5.17.	<i>*d^heh₁i-</i> ‘to contemplate, behold, see’	135
3.5.18.	<i>*d^her-men-</i> ‘support; agreement’	135
3.5.19.	<i>*d^hoiH-neh₂-</i> ‘conception; song’	136
3.5.20.	<i>*ǵorh₂-eie/o-</i> ‘to make old, let ripen’	136
3.5.21.	<i>*g^hrem-e/o-</i> ‘to murmur; to thunder, rage’	136
3.5.22.	<i>*g^{wes}-e/o-</i> ‘to be extinguished’, <i>*g^{wōs}-eie/o-</i> ‘to extinguish’	137
3.5.23.	<i>*g^{wi}-n-h₃-</i> ‘to feed’	137
3.5.24.	<i>*g^{wr}H-</i> ‘rock’	138
3.5.25.	<i>*g^(w)riH-ueh₂-</i> ‘neck, nape’	138
3.5.26.	<i>*(H)roh₁d^h-i</i> postpos. ‘on account of, for the sake of’	139
3.5.27.	<i>*h₁endro-</i> ‘kernel; egg, testicle’	140
3.5.28.	<i>*h₁(e)r(H)ks-</i> ‘thorn’	140
3.5.29.	<i>*h₁mene</i> ‘of me’ (1sg.gen. pronoun)	141
3.5.30.	<i>*h₁(o)r-ti-</i> ‘attack, fight’	141
3.5.31.	<i>*h₁ui-d^hh₁-eu-eh₂-</i> ‘widow’	142
3.5.32.	<i>*h₁ui-d^hh₁-u-r(i)o-</i> ‘separated’	142
3.5.33.	<i>*h_{2/3}eg^(w)-ro-</i> ‘top; first, early’	143
3.5.34.	<i>*h₂ep-</i> ‘water’	143
3.5.35.	<i>*h₂eu-</i> ‘to weave’	144
3.5.36.	<i>*h₂eu-o-</i> 3sg.pron. ‘that’	144
3.5.37.	<i>*(h₂)gr-ōm-</i> ‘heap’	145
3.5.38.	<i>*h₂ōu-is</i> ‘evidently, manifestly’	147
3.5.39.	<i>*h₂sous-eie/o-</i> ‘to make dry (up)’	147

3.5.40.	<i>*h₂uodH-eie/o-</i> ‘to speak’	148
3.5.41.	<i>*h₃nob^h-i-</i> / <i>*h₃nob^h-H-</i> ‘nave, navel’	148
3.5.42.	<i>*ieu-o-</i> ‘grain, barley’	149
3.5.43.	<i>*k_i(e)h₁-uo-</i> ‘dark, black, grey’	149
3.5.44.	<i>*k_{lei}-e/o-</i> ‘to lean against (intr.)’	150
3.5.45.	<i>*k_{ok}(H)olo-</i> ‘chip of wood’	150
3.5.46.	<i>*k_{or}-H(-keh₂)-</i> ‘a kind of bird’	151
3.5.47.	<i>*k_{un}-ko/eh₂-</i> ‘dog-like; bitch’	151
3.5.48.	<i>*kor-o-</i> ‘army’	152
3.5.49.	<i>*krouh₂-io-</i> ‘corpse; flesh’	152
3.5.50.	<i>*kseub^h-</i> ‘to sway, swing’	153
3.5.51.	<i>*kumēl-</i> ‘young (of animal)’	153
3.5.52.	<i>*k^weit-</i> ‘to perceive’	154
3.5.53.	<i>*k^(w)it-ti-</i> ‘thinking, consideration’	154
3.5.54.	<i>*k^wu-d^he</i> ‘where’	155
3.5.55.	<i>*leh₁ġ^h-</i> ‘to crawl; to go’	155
3.5.56.	<i>*loip-eie/o-</i> ‘to smear, stick’; <i>*li-n-p-e/o-</i> ‘to smear, stick’	156
3.5.57.	<i>*l(o)uk-i-</i> ‘light’	156
3.5.58.	<i>*loup-eie/o-</i> ‘to tear (off), peel’	157
3.5.59.	<i>*mei(H)-e/o-</i> ‘to (ex)change, switch’	157
3.5.60.	<i>*mor-o-</i> ‘plague’	157
3.5.61.	<i>*mud-ro-</i> ‘cheerful, lively’	158
3.5.62.	<i>*neig^h-o-</i> ‘itching, disease’	158
3.5.63.	<i>*oti-loik^w-o-</i> ‘leftover, surplus’	159
3.5.64.	<i>*ped-ti-</i> ‘walking on foot’	159
3.5.65.	<i>*pě(n)s-(n)u-</i> ‘dust, sand’	160
3.5.66.	<i>*perg^(w)enio-</i> / <i>*perk^(w)uHno-</i> ‘a (thunder) god’	161
3.5.67.	<i>*post-sk^(w)(-eH)</i> ‘behind, after, afterwards’	161
3.5.68.	<i>*poti-</i> ‘self’	162
3.5.69.	<i>*prh₂-uo-</i> ‘first, foremost’	162
3.5.70.	<i>*pusk-o-</i> ‘flower; tuft’	163
3.5.71.	<i>*seu-io-</i> ‘left’	163
3.5.72.	<i>*(s)poh₁i-men-</i> ‘foam’	164
3.5.73.	<i>*tek^w-</i> ‘to run (of water), flow’	164
3.5.74.	<i>*t(e)nH-u-ko-</i> ‘thin’	165
3.5.75.	<i>*tetk-</i> ‘to cut, hew, carpenter’	165
3.5.76.	<i>*teuh₂-</i> ‘to become fat’	166
3.5.77.	<i>*tok^w-o-</i> ‘course’	167
3.5.78.	<i>*top-eie/o-</i> ‘to make hot’	167
3.5.79.	<i>*tous-eie/o-</i> ‘to make calm, silent’	168
3.5.80.	<i>*tr-ne-d-</i> ‘to pierce, split’	168
3.5.81.	<i>*uer-</i> ‘to choose, put faith in’	168

3.5.82.	<i>*ure/o-to/eh₂</i> - ‘vow’	169
3.5.83.	<i>*urH-uo/eh₂</i> - ‘enclosure; hole, burrow’	169
4.	Analysis of the Indo-Slavic isogloss corpus.....	171
4.1.	Introduction.....	171
4.2.	Attestation across Indo-Aryan, Iranian, Baltic, Slavic	171
4.3.	Typological classification of isoglosses	173
4.3.1.	Shared borrowings	174
4.3.2.	Nominal derivation	174
4.3.3.	Verbal derivation	178
4.3.4.	Roots	179
4.3.5.	Semantics	179
4.4.	Semantic clusters in the isogloss corpus	181
4.4.1.	Agriculture	181
4.4.2.	Dairy	182
4.4.3.	Pastoralism.....	183
4.4.4.	Body parts.....	183
4.4.5.	Colours.....	184
4.4.6.	Magic and religion	184
4.5.	Non-exclusive isoglosses	184
4.5.1.	Albanian.....	185
4.5.2.	Armenian	185
4.5.3.	Celtic.....	185
4.5.4.	Germanic.....	185
4.5.5.	Greek.....	186
4.5.6.	Italic	186
4.5.7.	Tocharian	187
4.6.	Indo-Slavic? Innovations, archaisms, and quantity of isoglosses	187
4.7.	Indo-Slavic and alternative scenarios.....	188
4.7.1.	Graeco-Aryan hypothesis.....	188
4.7.2.	Primary split hypothesis.....	189
4.7.3.	Indo-Slavic hypothesis.....	190
4.7.4.	Indo-Balkan hypothesis.....	190
4.7.5.	Indo-Balto-Germanic hypothesis	191
4.7.6.	Indo-Balto-Albanian hypothesis	191
4.7.7.	Conclusion	192
5.	The archaeology and genetics of Indo-Iranian prehistory	195
5.1.	Introduction.....	195
5.2.	The Indo-European homeland question	196
5.3.	The Sintashta culture as an archaeological context for Proto-Indo-Iranian.....	198
5.4.	The Abashevo culture as an archaeological context for Pre-Proto-Indo-Iranian.	201
5.5.	From Yamnaya to Abashevo and Sintashta	205
5.5.1.	Scenario 1: Eastward migration hypothesis	205
5.5.2.	Scenario 2: via-Corded Ware hypothesis.....	207

5.5.3.	Scenario 3: Bell Beaker hypothesis	209
5.6.	Integration with linguistic evidence	210
5.7.	Limitations and outlook	215
6.	Bibliography	217
6.1.	Abbreviated works	217
6.2.	List by author	218
7.	Word index.....	249
7.1.	Indo-Aryan.....	249
7.1.1.	Sanskrit (Vedic).....	249
7.1.2.	Khowar	252
7.1.3.	Pāli	252
7.1.4.	Nepāli.....	252
7.1.5.	Sinhalese	252
7.2.	Iranian	252
7.2.1.	Old Avestan	252
7.2.2.	Young Avestan	252
7.2.3.	Old Persian.....	254
7.2.4.	Middle Persian	254
7.2.5.	Parthian	255
7.2.6.	Sogdian	255
7.2.7.	Khotanese	255
7.2.8.	Khwarezmian	255
7.2.9.	Bactrian.....	256
7.2.10.	Balochi.....	256
7.2.11.	Modern Persian	256
7.2.12.	Ormuri.....	256
7.2.13.	Ossetic.....	256
7.2.14.	Parači	256
7.2.15.	Pashto.....	256
7.2.16.	Roshani	256
7.2.17.	Shughni	256
7.2.18.	Tajik (Wanji).....	257
7.2.19.	Wakhi.....	257
7.2.20.	Wanetsi	257
7.2.21.	Yaghnobi.....	257
7.2.22.	Yazghulami.....	257
7.2.23.	Yidgha.....	257
7.2.24.	Munji.....	257
7.3.	Baltic.....	257
7.3.1.	Lithuanian	257
7.3.2.	Latvian	259
7.3.3.	Old Prussian.....	261
7.4.	Slavic.....	261

7.4.1.	Old Church Slavic.....	261
7.4.2.	Russian Church Slavic	262
7.4.3.	Serbian Church Slavic.....	262
7.4.4.	Croatian Church Slavic	262
7.4.5.	Church Slavic.....	262
7.4.6.	Bulgarian.....	263
7.4.7.	Czech	263
7.4.8.	Polish	263
7.4.9.	Russian.....	264
7.4.10.	Polabian	265
7.4.11.	Serbo-Croatian	265
7.4.12.	Slovene	266
7.4.13.	Ukranian	266
7.5.	Albanian.....	266
7.6.	Anatolian.....	267
7.6.1.	Hittite	267
7.6.2.	Cuneiform Luwian	267
7.6.3.	Hieroglyphic Luwian	267
7.6.4.	Lycian	267
7.6.5.	Lydian.....	267
7.6.6.	Carian.....	267
7.7.	Armenian.....	267
7.8.	Celtic	267
7.8.1.	Gaulish.....	267
7.8.2.	Old Irish	267
7.8.3.	Middle Irish.....	268
7.8.4.	Old Breton	268
7.8.5.	Middle Breton	268
7.8.6.	Breton	268
7.8.7.	Middle Welsh.....	268
7.9.	Germanic.....	268
7.9.1.	Gothic	268
7.9.2.	Old High German.....	268
7.9.3.	Middle High German	268
7.9.4.	German	268
7.9.5.	Dutch.....	268
7.9.6.	Old Saxon	268
7.9.7.	Old English	268
7.9.8.	English	269
7.9.9.	Old Norse.....	269
7.9.10.	Faroese	269
7.9.11.	Norwegian.....	269
7.9.12.	Old Swedish.....	269

7.9.13. Swedish.....	269
7.10. Greek.....	269
7.11. Italic	270
7.11.1. Latin.....	270
7.11.2. Oscan	271
7.11.3. Umbrian	271
7.12. Phrygian	271
7.12.1. Old Phrygian.....	271
7.13. Tocharian	271
7.13.1. Tocharian A	271
7.13.2. Tocharian B.....	271
Nederlandse samenvatting.....	272
Curriculum Vitae	272

List of tables and figures

Tables

Table 1. Criteria for classification of Indo-Slavic lexical isoglosses.	40
Table 2. Summary of archaeological cultures discussed in the chapter. EBA = Early Bronze Age, MBA = Middle Bronze Age, LBA = Late Bronze Age.	196
Table 3. Interdisciplinary compatibility of three hypotheses on Indo-Iranian origins.	214

Figures

Figure 1. The supporters of three major hypotheses on the position of Indo-Iranian discussed in Chapter 1.	9
Figure 2. Schleicher's Indo-European family tree (1861).	16
Figure 3. Pictet's divergence model (1859).	24
Figure 4. Meillet's Indo-European dialectal model (1908).	25
Figure 5. Bonfante's Indo-European dialectal model (1976/1931).	26
Figure 6. Bloomfield's Indo-European dialectal model (1935: 316).	27
Figure 7. Anttila's Indo-European dialectal model (1972: 305).	28
Figure 8. Gamkrelidze & Ivanov's Indo-European areal-genetic model (1995: 363).	32
Figure 9. Language fissure according to Ross (1997).	33
Figure 10. Lectal differentiation according to Ross (1997).	34
Figure 11. Isogloss distribution across (sub)branches.	172
Figure 12. Typology of Indo-Slavic lexical isoglosses.	174
Figure 13. Model of the prehistoric dispersal of Indo-Iranian in the via-Corded Ware scenario. Archaeological cultures are given with dates BCE. Names for the chronological stages in the development from Core Indo-European to Indo-Iranian are indicated in blue. Approximate dispersal route of Indo-Slavic and Indo-Iranian is marked with arrows.	215

List of abbreviations

General

AB	Aitareyabrāhmaṇa
ĀpŚS	Āpastambaśrautasūtra
AV	Atharvaveda (Saṃhitās)
AVParīś	Atharvavedaparīśiṣṭas
BCE	before common era
BMAC	Bactria-Margiana archaeological complex
BP	before present
Br.	Brāhmaṇas
Car.	Carakasamhitā
CE	common era
Dhātup.	Dhātupāṭha
dial.	dialectal
EBA	Early Bronze Age
Ench.	Enchiridion
Ep.	Epics
EV	Elbing Vocabulary
GṛSū.	Gṛhyasūtra
intr.	intransitive
JB	Jaiminīyabrāhmaṇa
KauśS	Kauśikasūtra
Kāv.	Kāvya
KS	Kaṭhasamhitā
LBA	Late Bronze Age
Lex.	lexicographical
MBA	Middle Bronze Age
MBh.	Mahābhārata
N	Nērangestān
Ny	Niyāyiś
p.c.	personal communication
Pāṇ.	Pāṇini's Aṣṭādhyāyī
PN	personal name
PS	Paippalādasamhitā
Ragh.	Raghuvamśa
Rājat.	Rājatarāṅginī
RV	Ṛgveda (Saṃhitā)
S	supplement
ŚB	Śatapathabrāhmaṇa
ŚS	Śaunakasamhitā
Sū.	Sūtras

Suśr.	Suśrutasaṃhitā
tr.	transitive
TS	Taittirīyasaṃhitā
VarBṛS	Varāhamihirabṛhatsaṃhitā
VS	Vājasaneyisaṃhitā
Yt	Yašt
YV	Yajurveda (Saṃhitās)

Symbols

*	reconstructed form
**	incorrectly reconstructed form
Ø	zero (morpheme)
◦	attested in a compound, part of word missing
<	regular sound change from
>	regular sound change to
<<	irregular/analogical change, semantic change, borrowing from
>>	irregular/analogical change, semantic change, borrowing to
/ /	phonological transcription
[]	phonetic transcription
< >	orthographic transcription
C	any consonant
V	any vowel
N	any nasal
H	any laryngeal
R	any resonant

Languages

Alb.	Albanian	Gaul.	Gaulish
Arm.	Armenian	Ger.	German
Av.	Avestan	Goth.	Gothic
Bactr.	Bactrian	Gr.	Ancient Greek
Bal.	Balochi	Hitt.	Hittite
Bret.	Breton	HLuw.	Hieroglyphic Luwian
Bulg.	Bulgarian	I.	Iron (Ossetic)
Car.	Carian	Ilr.	Indo-Iranian
CLuw.	Cuneiform Luwian	Ion.	Ionian
CroatCS.	Croatian Church Slavic	Khot.	Khotanese
CS.	Church Slavic	Khow.	Khowar
Cz.	Czech	Khwar.	Khwarezmian
D.	Digoron (Ossetic)	Lat.	Latin
Dor.	Doric	Latv.	Latvian
Du.	Dutch	Lesb.	Lesbian
Eng.	English	Lith.	Lithuanian
Far.	Faroese	Luw.	Luwian

Lyc.....	Lycian	Pol.....	Polish
Lyd.	Lydian	Psht.	Pashto
Man.	Manichaean	PSl.	Proto-Slavic
MBret.	Middle Breton	Rosh.....	Roshani
MHG	Middle High German	RuCS.....	Russian Church Slavic
MiP.....	Middle Persian	SCr.....	Serbo-Croatian
Mlr.....	Middle Irish	SerbCS.....	Serbian Church Slavic
MoP.....	Modern Persian	Shu.	Shughni
Mu.	Munji	Si.....	Sinhalese
MWelsh	Middle Welsh	Skt.....	Sanskrit
Nep.	Nepāli	Sln.....	Slovene
Novg.....	Novgorodian	Sogd.....	Sogdian
Nw.	Norwegian	Sogd. B	Buddhist Sogdian
OAv.	Old Avestan	Sogd. C	Christian Sogdian
OBret.	Old Breton	Sogd. M	Manichaean Sogdian
OCS.....	Old Church Slavic	Sogd. S.....	Sogdian, Sogdian script
OCz.	Old Czech	Sw.	Swedish
OE	Old English	Taj. Wj.....	Tajik (Wanji)
OHG.....	Old High German	ToA.....	Tocharian A
OIr.	Old Irish	ToB.....	Tocharian B
OKhot.....	Old Khotanese	Ukr.....	Ukrainian
OLith.	Old Lithuanian	Umbr.....	Umbrian
ON.....	Old Norse	Wakh.....	Wakhi
OP.....	Old Persian	Wan.....	Wanetsi
OPhyrg.	Old Phrygian	Yagh.	Yagnobi
OPol.....	Old Polish	YAv.	Young Avestan
OPr.	Old Prussian	Yazg.....	Yazghulami
Orm.	Ormuri	Yi.	Yidgha
ORu.	Old Russian	Žem.....	Žemaitian (Lithuanian)
OS.....	Old Saxon		
Osc.....	Oscan		
Oss.....	Ossetic		
OSw.....	Old Swedish		
Pā.....	Pāli		
Pahl.....	Pahlavi		
Pal.....	Palaic		
Par.	Parači		
Parth.	Parthian		
PBSl.....	Proto-Balto-Slavic		
PCelt.....	Proto-Celtic		
PGm.....	Proto-Germanic		
PGr.	Proto-Greek		
Phryg.	Phrygian		
PIE.....	Proto-Indo-European		
PIIr.....	Proto-Indo-Iranian		
PIr.	Proto-Iranian		
Plb.	Polabian		

1. Introduction

1.1. Preliminaries: historical linguistics and the study of human prehistory

Historical linguistics, despite the name, is just as much concerned with the prehistory as with the history of the human past. By definition, the reconstruction of protolanguages through the *comparative method* recovers linguistic structures and lexicon dating before the written attestation of the languages in question. In this sense, historical linguistics provides its own unique perspective on human prehistory, independent from and complementary to archaeology, which may be seen as the study of human prehistory *par excellence*.

At its core, archaeology studies human activity through material remains. The discipline has evolved into relying more and more on methods from natural sciences (Kristiansen 2014; Sørensen 2017), such as radiocarbon dating and stable isotope analysis (Vogel & Van Der Merwe 1977; Hanks et al. 2018; Sabatini et al. 2022; Pospieszny et al. 2023); in this sense, modern archaeology is fundamentally interdisciplinary. Through systematic analysis of artefacts, material complexes may be identified and classified into *cultures*, which are bounded in time and space. The concept of the *archaeological culture* has been criticized (Willey & Phillips 1958), as it has been used anachronistically for one-to-one equations of material culture with ethnic, racial or linguistic groups (Kossinna 1911; Childe 1929). However, the term is still widely used in the archaeological literature, and while culture-historical narratives in the style of Kossinna and Childe have largely been abandoned, *archaeological culture* as a descriptive term has not (Roberts & Linden 2011). In the present work, the term archaeological culture will be used to refer to “assemblages of artefacts” (Roberts & Linden 2011: 1), bounded in time and space, which have been classified as meaningful units in the archaeological literature. In this way, archaeological cultures are not seen as monolithic entities awaiting attribution to an ethno-linguistic group, but as a system of classification that has meaning within archaeology itself. From this perspective, archaeological evidence can be compared to evidence from other disciplines, such as historical linguistics.

During the 2010s, population genomics has emerged as a new line of evidence for prehistory through the study of ancient DNA (cf. the seminal studies by Allentoft et al. 2015; Haak et al. 2015). The full potential of ancient DNA is yet to be realized, as new methodologies are continuously being developed (e.g., for identifying identity by descent (IBD) in ancient individuals, see Ringbauer et al. 2023), but it has already had a massive

impact on the scientific discourse (Kroonen & Kristiansen 2023). In many ways, it has brought about a paradigm shift in the study of prehistory toward an increased focus on human mobility and migration, as it makes it possible to test hypotheses regarding the relationship between modern and ancient populations directly through genetic relatedness.

Historical linguistics holds an intermediate position between archaeology and genetics, since language is, on the one hand, a cultural phenomenon shaped by specific cultural conditions and interaction both within and between communities, and, on the other hand, a natural phenomenon, in the sense that it is a fundamental property of human cognition that is passed down through the generations, much like genes. By using the comparative method, historical linguistics can prove relatedness of attested languages that go back to a prehistoric common ancestor (Hock 1991: 567). By reconstructing the lexicon of the protolanguage, aspects of the culture of the speakers of the protolanguage can be reconstructed, which can be compared with the archaeological record to locate the protolanguage community in time and space; this is an extension of the comparative method termed *linguistic palaeontology* (Pictet 1859–1863; Mallory 2021). The phylogeny of language families like Indo-European, i.e., the internal structure of the family tree, can provide further clues as to how the protolanguage diverged, which can be compared with archaeological and genetic hypotheses on prehistoric migrations, population movements, and contact situations.

1.2. Aim of the thesis

The aim of the present study is to uncover the earliest prehistory of Indo-Iranian, meaning the period between the split of Core Proto-Indo-European¹ and Proto-Indo-Iranian, by investigating the proposed phylogenetic subgroup consisting of the Indo-Iranian and Balto-Slavic branches, here termed Indo-Slavic.² These branches have been hypothesized to be connected by phonological and lexical isoglosses (Kuhn 1850: 324; Schmidt 1872; Arntz 1933; Porzig 1954; Ringe, Warnow & Taylor 2002). As we will see, while the phonological isoglosses cannot be proven to be exclusive to these two branches, the quantity and quality of the lexical isoglosses are not well understood, since previous studies are either outdated (Arntz 1933) or incomplete (Porzig 1954). Thus, the status of the Indo-Iranian-Balto-Slavic lexical isoglosses as evidence for an Indo-Slavic subgroup will be compiled and evaluated. The resulting isogloss corpus will serve as a basis for evaluating three competing hypotheses on the prehistoric dispersal of Indo-Iranian.

1.3. State of the art: the position of Indo-Iranian within the Indo-European language family

Indo-Iranian has always held a central place in Indo-European linguistics. Before the realization that Armenian is an independent branch (Hübschmann 1877), and before the

¹ I use the term Core (Proto-)Indo-European to denote a subgroup consisting of the non-Anatolian branches.

² For a discussion of this terminology, see Olander (2019).

discovery of Anatolian and Tocharian, Indo-Iranian was the sole proof that the Indo-European language family was not an exclusively European phenomenon. Moreover, it is one of the earliest attested branches with a rich literary tradition.

The debate on the position of Indo-Iranian within the Indo-European language family goes back to the pre-neogrammarian period. Schleicher (1853; 1861: 4–7) introduced the family tree model (*Stammbaumtheorie*) to Indo-European linguistics, dividing the Indo-European language family into three main groups: Asian (Indo-Iranian, Armenian still being counted as part of Iranian), southwest (Italo-Celtic, Greek, Albanian), and north (Balto-Slavic, Germanic). He argued that the Asian and southwest branches are more closely related, which may be seen as an early version of the Graeco-Aryan hypothesis.³ Contrary to modern methodology (cf. Chapter 2), this conclusion seems to be based mainly on shared archaic features rather than innovations, i.e., the Asian and southwest branches were considered to be closer to Proto-Indo-European than the northern branch.⁴ A Graeco-Aryan subgroup was supported by Kern (1858), based on the shared outcome of PIE **ŋ*; by Grassmann (1863a: 109; 1863b: 119), based on alleged similar treatments of Indo-European aspirates; and by Kretschmer (1896: 168–170), who also included Phrygian and Armenian in this group, based on the augment, the prohibitive particle **meh₁*, the correspondence between Skt. *sahāśra-* ~ Gr. χεῖλιοι ‘thousand’, etc.

On the other hand, a close relationship between Germanic and Balto-Slavic (Schleicher’s *Slawodeutsch*) had been proposed already by Zeuss (1837: 18) and Grimm (1848: 1024–26, 1030) based on a number of isoglosses, including the Germanic weak adjectival declension next to the Balto-Slavic definite adjectival declension, as well as lexical correspondences. Schleicher supported this hypothesis in several papers (1852; 1855; 1858a) and pointed to the Balto-Slavic and Germanic dat.pl. in *-m-* as an additional shared feature (Schleicher 1858b: 13; cf. also Leskien 1876: 157).

A competing hypothesis, perhaps first articulated by M. Müller (1853: 67), but developed by Lottner (1858a; 1858b), argued that Proto-Indo-European first split into an Indo-Iranian and a European subgroup (see also Fick 1870; 1873). According to Lottner (1858a: 19–24), the European branches share the distinction of **l* and **r*, various prepositions, and agricultural vocabulary to the exclusion of Indo-Iranian. The alleged lack of inherited agricultural terms in Indo-Iranian vs. the shared agricultural terms in the European branches was taken as evidence that the European branches must have separated from the Asian part of the language family before transitioning to an agricultural economy (Mommsen 1854: 14–15; more explicitly in Mommsen 1865: 15–16; Pictet 1859–1863: II, p. 121–22; Schrader 1883: 356–57; 1890: 284; Brandenstein 1936: 28). In this way, the internal structure of the family tree was inferred by reconstructing the chronology and

³ An alternative term is Indo-Greek. However, this is ambiguous, since it also refers to the 2nd century BCE Yavana Kingdom, as well as to a larger proposed subgroup of Indo-European, uniting not only Indo-Iranian and Greek but also Armenian, Albanian, and Balto-Slavic (Olander 2019).

⁴ “Die indogermanische ursprache teilte sich zuerst durch ungleiche entwicklung in verschiedenen teilen ihres gebietes in zwei teile, es schied nämlich von ihr auß das slawodeutsche [...]; sodann teilte sich der zurückbleibende stock der ursprache, das ariograecoitalokeltische, in graecoitalokeltisch und arisch [...]. Je östlicher ein indogermanisches volk wont, desto mer altes hat seine sprache erhalten, je westlicher, desto weniger altes und desto mer neubildungen enthält sie” (Schleicher 1853: 6).

geography of how Indo-European-speaking groups emigrated from the homeland, i.e., based on linguistic palaeontology (cf. 2.5).

A third position was taken by Kuhn (1850: 324), Bopp (1853: 4), and Latham (1862: 610), who argued for a closer relationship between Indo-Iranian and Balto-Slavic based on their status as satem languages, i.e., that they merge the Proto-Indo-European velars with the labiovelars and continue the palatovelars as sibilants/affricates. A close relationship between Indo-Iranian and Balto-Slavic had already been articulated by Zeuss (1837: 20), although he believed the connection between the latter and Germanic to be stronger. F. Müller (1873: 70) grouped Indo-Iranian, Balto-Slavic and Germanic together, from which Germanic subsequently separated, as opposed to a Celtic-Italic-Greek subgroup. After the recognition of Armenian as a separate branch (Hübschmann 1877), von Bradke (1890: 63) grouped all satem languages together.

Thus, already in the 1850s, three main hypotheses regarding the position of Indo-Iranian had been formulated: 1) a closer relationship to Greek and other so-called southwestern branches, 2) an early split from all European branches, 3) a primary division of centum and satem languages, Indo-Iranian of course belonging to the latter group. Consequently, Brugmann (1884; 1886: 1–3) stated that no subgroups, i.e., phylogenetic units comprising more than one branch, had been proven.

Not only was the internal structure of the family tree an open question, but the tree model itself was quickly called into question: already in 1872, Schmidt, a student of Schleicher, proposed the alternative wave model (*Wellentheorie*).⁵ Instead of viewing the Indo-European language family as a result of a series of splits from an original monolithic protolanguage, the wave model envisions a continuum of contiguous dialects that over time develop into separate branches. Innovations spread from various centres of innovation, gradually affecting contiguous dialects. In this way, isoglosses can be explained without assuming that branches with shared features belong to the same subgroup to the exclusion of other branches. As evidence for his model, Schmidt presented lists of lexical isoglosses shared by various branch combinations.⁶ The results show, according to Schmidt, that Balto-Slavic descends from an intermediate dialect between Germanic and Indo-Iranian.

Meillet (1908) further developed Schmidt's methodology, defining the relationship between the branches of Indo-European in terms of dialect areas. Moreover, he rejected the idea of a uniform protolanguage, emphasizing that language is in a constant state of variation. According to Meillet, the Indo-European language family can be divided into a western (Celtic, Italic, Germanic, Greek) and an eastern (Albanian, Armenian, Balto-Slavic,

⁵ The main principles of the wave model, e.g., that Proto-Indo-European diverged gradually as geographically neighbouring dialects influenced each other, eventually giving rise to the various language branches, were already formulated by Pictet (1859–1863: I, p. 48): “Les émigrations lointaines auront été précédées par une extension graduelle, dans le cours de laquelle se seront formés peu à peu des dialectes distincts, mais toujours en contact les uns avec les autres, et d’autant plus analogues qu’ils étaient plus voisins entre eux.” A similar idea was articulated by Schuchardt in 1866, with respect to the Romance languages: “Jede allgemeine Sprachveränderung entspringt auf einem beschränkten Raume und breitet sich nur allmählich über das ganze Sprachgebiet aus” (Schuchardt 1866: 103).

⁶ Germanic-Balto-Slavic: 143 isoglosses, Balto-Slavic-Indo-Iranian: 61, Germanic-Indo-Iranian: 15, Germanic-Balto-Slavic-Indo-Iranian: 14, Greek-Italic: 132, Greek-Indo-Iranian: 99, Italic-Indo-Iranian: 20, Greek-Italic-Indo-Iranian: 4, Greek-Balto-Slavic-Indo-Iranian: 10 (Schmidt 1872).

Indo-Iranian) dialect group, corresponding to the centum and satem groups. These groups are not rigid, however, as isoglosses sometimes cross the centum/satem divide. For example, Meillet (1908: 17ff) defined a “northwestern” dialect area based on shared vocabulary in Balto-Slavic, Germanic, Italic, and Celtic. Meillet’s methodology (1908: 10) states that only branches that were (at some point) geographically contiguous can be part of the same dialect area. In itself, this makes sense, but combined with the flexibility of the wave model, it introduces a high risk of circularity. Thus, when Meillet (1908: 135) eventually concludes that the Indo-European dialects were never displaced, i.e., the relative geographical position of the branches in the historical era is identical to the relative position of the Proto-Indo-European dialect groups that they developed from, it may be argued that the result is biased.

Meillet’s dialectal model was complicated by the discovery of Tocharian (in 1908), which shares the centum treatment of the velars and *r*-endings in the middle with the western branches, despite being attested as far east as the Tarim Basin. To explain this, it may be argued that the centum languages are archaic, i.e., that satemization and *i*-endings in the middle are innovations of the “central” Indo-European dialects (Porzig 1954: 44; Burrow 1973: 13–14). However, the decipherment of Hittite (Hrozný 1915) and the other Anatolian languages, geographically situated between Greek, Armenian and Indo-Iranian, but linguistically divergent in many respects, meant that the dialectal distribution could no longer be accounted for in the way Meillet had attempted.

Porzig (1954) reassessed the question of whether the branches of Indo-European reflect dialectal differences that were already present in Proto-Indo-European. He collected isoglosses that unite various branch combinations, supporting Meillet’s basic division into a western and an eastern group, although he considered Greek as part of the latter. As for Hittite (= Anatolian), Tocharian and Albanian, Porzig tentatively groups them together with the eastern group. In this model, the centum/satem isogloss is given less weight and is argued to postdate most other dialectal innovations. Indo-Iranian is seen as a branch in the eastern periphery of the dialect area, evidenced by archaisms shared with Italic and Celtic, representing the western periphery. Tocharian is argued to be particularly close to Balto-Slavic and Germanic. In this sense, Tocharian is believed to have been displaced from its relative prehistoric geographical position, being attested closer to Indo-Iranian. Importantly, Porzig thus attempts to derive the relative prehistoric positions of the branches from the linguistic evidence, not the other way around. However, he does not apply this practice consistently. Since Porzig’s definition of archaism vs. shared innovation is at times problematic (cf. 2.2.3), it is unclear why his Indo-Iranian-Italic-Celtic isoglosses should not have consequences for his understanding of the prehistoric geographic position of Indo-Iranian, unless the historical geographic position of the branches has been allowed to influence the analysis of shared features as archaisms or innovations.

In terms of shared dialectal innovations pertaining to Indo-Iranian, Porzig (1954: 157ff) lists features shared by Indo-Iranian and Balto-Slavic on the one hand and by Indo-Iranian, Greek and Armenian on the other, as well as features shared by all four branches. Indo-Iranian is argued to share 21 isoglosses with Balto-Slavic, including a future in **-sie/o-*, the RUKI rule and 16 lexemes. Indo-Iranian and Greek are according to Porzig

united by 16 isoglosses, including the comparative in **-tero-* and 13 lexemes. Furthermore, Armenian is argued to share seven lexemes with Indo-Iranian, and five with both Indo-Iranian and Greek. While earlier works had claimed that the shared lexical material of Indo-Iranian and Balto-Slavic is particularly rich (especially Arntz 1933, listing over 300 isoglosses; cf. also Schmidt 1872; Meillet 1926; Bonfante 1931), Porzig's Indo-Iranian-Balto-Slavic list is thus only slightly longer than the Indo-Iranian-Greek one.

In the latter half of the 20th century, much of the research on Indo-European subgrouping was concerned with the position of Anatolian and Tocharian. While Forrer (1921) and Sturtevant (1926; 1933) had formulated the Indo-Anatolian hypothesis, in which all non-Anatolian branches formed a subgroup after Anatolian had split off,⁷ Pedersen (1938: 190–91) stated that Anatolian had lost certain features, but retained others (archaisms) that had been lost elsewhere, basically treating Anatolian as any other branch. Eichner (1975: 100) argued that Anatolian in fact shows traces of certain Proto-Indo-European verbal categories that at first glance seem to be absent, which shows that they do not represent shared innovations in the non-Anatolian branches. This so-called *Schwundhypothese* was cautiously supported by Rieken (2009). An intermediate hypothesis argues that Anatolian separated early from the rest of Indo-European, but that the other branches did not undergo enough shared innovations to justify calling them a subgroup (Meid 1975; Neu 1976; Melchert 1998). Puhvel (1994) advocated a dialectal model in which Anatolian was close to the western branches (Celtic, Italic, Germanic, Greek, sometimes including Tocharian). However, there is increasing support for the Indo-Anatolian hypothesis (Cowgill 1974; Gamkrelidze & Ivanov 1995: 363; Lehrman 1996; Oettinger 2014). Kloekhorst & Pronk (2019) have compiled 34 innovations, of which 23 are classified as plausible, shared by the non-Anatolian branches, which convincingly show that Proto-Indo-Anatolian split in a tree-like fashion into an Anatolian and a Core Indo-European subgroup. As for Tocharian, it is still unclear whether it reflects an early split defined by shared innovations of the non-Tocharian Core Indo-European branches (Peyrot 2022).

The Graeco-Aryan hypothesis, which posits a subgroup or dialect group consisting of Indo-Iranian, Greek, and often Armenian, also gained a more prominent status during this time. In his handbook, Fortson states that “it is widely thought that Indo-Iranian forms a subgroup with Greek, Armenian, and Phrygian” (2010: 203). Birwé (1956) and Meid (1975) argued that some of the similarities in the verbal system of Indo-Iranian and Greek may be shared innovations, although they explained this as a result of dialectal contact rather than descent from a common subgroup. However, as Kümmel (2022: 262) has argued, features like the reduplicated perfect and augmented imperfect are better analysed as archaisms (cf. Hoffmann 1970; Schlerath 1981). Euler (1979) studied shared features in nominal derivation in Indo-Iranian, Greek, and Armenian, which he argues form a dialect

⁷ Forrer (1921: 26–27) even regarded Luwian as an earlier split than Hittite. It should be noted that the arguments on which Forrer and Sturtevant based their conclusions are different from those compiled by Kloekhorst & Pronk (2019). Rather than basing their conclusions on shared innovations of the non-Anatolian branches, Forrer and Sturtevant regarded Anatolian as having lost a host of features from the protolanguage, which in their view indicated an early split.

group within a wider eastern Indo-European group that also includes Balto-Slavic. Similarly, Gamkrelidze & Ivanov (1995: 345–73) group Indo-Iranian, Greek, and Armenian together based on morphological, phonological, and lexical isoglosses,⁸ but treat them as a dialect group rather than a subgroup in the strict sense. In Gamkrelidze & Ivanov’s model, the satem languages undergo shared innovations despite belonging to different primary groupings (i.e., Graeco-Aryan and Balto-Slavic-Germanic). Thus, in most articulations of the Graeco-Aryan hypothesis, Greek and Indo-Iranian are not derived from a uniform protolanguage but rather from a differentiated dialect group. A close relationship between Greek and Indo-Iranian has also been assumed in works on Indo-European comparative poetry and religion (Watkins 1995: 309; West 2007: 6, 46).

The second half of the 20th and early 21st centuries also saw the rise of statistical and computational methods for subgrouping in Indo-European and historical linguistics in general (already Kroeber & Chrétien 1937; Gleason 1959; Tischler 1973; Davies & Ross 1975; Dyen, Kruskal & Black 1992; Bird 1993). Ringe, Warnow & Taylor (2002) generated a family tree based on a dataset of 370 phonological, morphological, and lexical features, called *characters* (cf. 2.2.1). Aside from Anatolian representing the first split against the rest of the family, followed by Tocharian, the results group Indo-Iranian together with Balto-Slavic, which form a node within a larger subgroup together with Graeco-Armenian. In their model, the Indo-Slavic node is based on three isoglosses: 1) the merger of the velars **K* and labiovelars **K^w*, 2) the RUKI rule, i.e., retraction of **s* after **i*, **u*, **r*, **K^w*, and 3) the lexeme **ui-* ‘all’ (Ringe, Warnow & Taylor 2002: 104).

Kassian et al. (2021) generated a family tree combining the results of three different phylogenetic algorithms, based on 13 110-item Swadesh wordlists, each representing a branch of Indo-European.⁹ The results basically support those of Ringe, Warnow & Taylor (2002). Anatolian, followed by Tocharian, are the earliest splits, whereas Indo-Iranian and Balto-Slavic form a subgroup. The Indo-Iranian and Balto-Slavic wordlists share 11 out of 110 lexical items to the exclusion of the other branches, although only one (**pleu-* ‘to swim’) is argued to be a compelling shared innovation (Kassian et al. 2021: S110). The Indo-Slavic node is part of a so-called Inner Indo-European clade together with Graeco-Armenian, Italic-Celtic-Germanic, and Albanian. The Inner Indo-European clade splits into four subgroups without demonstrable internal bifurcations.

A similar tree model is advocated by Olander (2019) and Søbørg (2020: 5), in which all branches except Anatolian and Tocharian are grouped together under the label Indo-Celtic. This clade splits into an Italo-Celtic and an Indo-Germanic clade, the latter consisting of Albanian, Armenian, Balto-Slavic, Germanic, Greek, and Indo-Iranian. Within this clade, Indo-Iranian and Balto-Slavic are argued to form an Indo-Slavic

⁸ Morphological: gen.sg. **-osio*, case endings in **-b^hi-*, a comparative in **-tero-*, athematic and thematic aorists. Apart from the comparative in **-tero-*, these features are not exclusively Graeco-Aryan, however.

Phonological: **ŋ*, **ŋ̥* > **a*. This sound change does not include Armenian or Phrygian, however, the latter being the closest relative of Greek (Obrador-Cursach 2020: 67, 127).

As for Graeco-Aryan lexical isoglosses, Gamkrelidze & Ivanov cite Porzig (1954). For more comprehensive studies on Indo-Iranian-Greek-Armenian lexical isoglosses, see Solta (1960) and Martirosyan (2013).

⁹ Baltic, Slavic, Indo-Aryan, Iranian, Old Irish, and Brittonic are represented by independent wordlists.

subgroup. As evidence for this, Søbørg (2020: 7) cites the RUKI rule, palatalization of the palatovelars, the merger of **K* and **Kʷ*, as well as seven lexical innovations. After the split of Indo-Germanic, the next branch to split off (i.e., stop taking part in shared innovations) in Olander’s (2019: 241) model is Greek, followed by Armenian and Albanian (after which Indo-Slavic splits into Indo-Iranian and Balto-Slavic). Søbørg (2020: 5), on the other hand, argues for a “Balkanic” subgroup (cf. Van Windekens 1963; Klingenschmitt 1994), consisting of Albanian, Armenian and Greek, as well as Messapic and Phrygian, which undergo shared innovations to the exclusion of Indo-Slavic.

Yet, besides the Graeco-Aryan and Indo-Slavic hypotheses, the “primary split” hypothesis has still retained some support. Hamp (1990), while accepting the Indo-Anatolian hypothesis, argues for Indo-Iranian to be the second branch to split from the rest, whereas Balto-Slavic, Germanic, Albanian, and Celtic form a “northern” dialect group based on shared substratal developments. Kümmel (2022: 251) argues that the Indo-Iranian vocalization of laryngeals to **i*, as opposed to **a* in several other branches, could point to an early divergence from the rest of the family, but cautions that the development in the other branches need not be a shared innovation. Ultimately, he concludes that Indo-Iranian shares features with the satem branches, as well as, on the one hand, the northern branches (Balto-Slavic, Germanic) and, on the other hand, the southern branches (Greek, Albanian, Armenian), but that it does not clearly form a subgroup with any other branch.

Thus, it appears that the current hypotheses on the position of Indo-Iranian are basically the same as those already formulated in the 19th century: 1) the Graeco-Aryan hypothesis, i.e., a subgroup or close dialectal relationship between Indo-Iranian, Greek, Armenian, going back to Schleicher (1853), with the difference that Italic is no longer included in this grouping; 2) the primary split hypothesis, i.e., Indo-Iranian is not part of any subgroup (now specifically within Core Indo-European rather than within Indo-European as a whole); and 3) the Indo-Slavic hypothesis, i.e., a subgroup or close dialectal relationship with Balto-Slavic. In other words, the question remains unsolved, unless one settles for a radical wave model (e.g., Huld 1996), which can combine all three hypotheses by assuming that Indo-Iranian shares innovations with Greek and Armenian on the one hand, and Balto-Slavic on the other, while at the same time being clearly separated from the European branches. The various proponents of the different hypotheses are summarized in Figure 1.

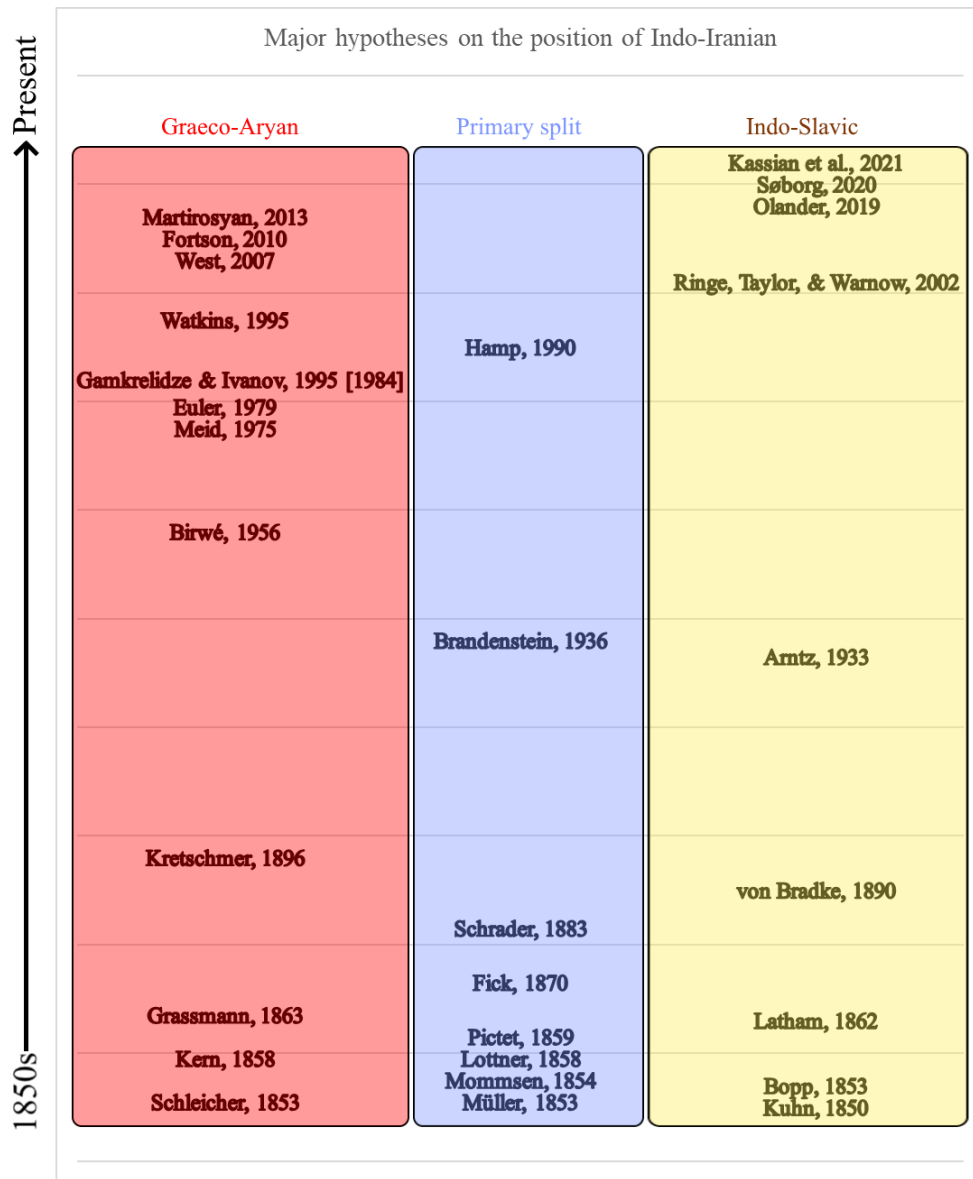


Figure 1. The supporters of three major hypotheses on the position of Indo-Iranian discussed in Chapter 1.

As mentioned above, already Pictet (1859–1863) and Schrader (1883) turned to interdisciplinary methods to infer the relationship between the branches of Indo-European. In some ways, this approach has been revived following the advances in population genomics and ancient DNA. Based on a combination of genome samples of modern Indo-Iranian-speaking individuals and ancient individuals from hypothesized Indo-Iranian-speaking contexts, Narasimhan et al. (2019) found that the genetic ancestors of Indo-Iranian

speakers were similar to populations classified archaeologically as belonging to the Corded Ware cultures of central and eastern Europe.¹⁰ The Corded Ware cultures have often been taken as an archaeological proxy for the ancestors of the speakers of Germanic and Balto-Slavic (Anthony 2007: 367) as well as Italic and Celtic (Specht 1934; Mallory 1989: 264; Huld 1996). Narasimhan et al. (2019: 11) explicitly propose that a Corded Ware origin of Indo-Iranian correlates to the linguistic affiliation between it and Balto-Slavic, citing satemization and the RUKI rule as evidence.

A few remarks on the process of satemization and the RUKI rule are due in order to highlight the problems of using these sound changes to infer Indo-European phylogenetic relationships. First, since the reconstruction of the Proto-Indo-European velars is debated (cf. Steensland 1973: 1–2; Kümmel 2007: 310ff), it is uncertain to what extent satemization can be regarded as a shared innovation. In the traditional three-way system, with contrastive palatovelar **ḱ*, velar **k*, and labiovelar **kʷ* (Bezzenger 1890: 259; Bugge 1890: 108, fn. 1; Osthoff 1890: 63–64, fn. 1), the process of satemization solely implies the merger of **k* and **kʷ* by loss of labialization: no palatalization need be assumed (cf. Panzer 1982). Since almost all Indo-European languages merged **k* with either **ḱ* or **kʷ*, however, the development may simply have affected various branches independently (on the status of Luwian, Albanian and Armenian, see below).

As an alternative to the three-way reconstruction, Meillet (1894) proposed that the pure velar series was not phonemic, but arose through conditional neutralizations of **ḱ* and **kʷ*; the centum languages merged this neutralized velar with **ḱ*, while the satem languages merged it with **kʷ* (cf. Kortlandt 1978b). However, Reichelt (1922) and Kuryłowicz (1935: 23; 1971) argued that Proto-Indo-European had a two-velar system of **ḱ* and **k*, in which **kʷ* is a later innovation of the centum languages, which implies that satemization is a retention and thus non-probative for subgrouping. Conversely, Hirt (1899: 224), while also working with a two-velar system, argued that Proto-Indo-European had **k* and **kʷ*, in which case the palatalization of **k* and delabialization of **kʷ* are innovations in the satem languages (also Meillet 1934: 92–93). This is essentially the position taken by Ringe, Warnow & Taylor (2002: 113). Steensland (1973: 125–27) reaches a similar conclusion, reconstructing Proto-Indo-European **k* vs. **kʷ*, but argues that **ḱ* originated as a conditioned allophone of **k*, which became the default realization of the phoneme in the satem languages (cf. Shields 1981). Steensland maintains that this may just as well be an independent development of the individual branches as a shared innovation of the satem group. Thus, even with a reconstruction **k* vs. **kʷ*, satemization may be seen as a trivial change.

Before the discovery of Hittite and Tocharian, the centum/satem isogloss seemed to divide the Indo-European languages into a western and an eastern group (Pedersen 1931: 318). At first glance, the fact that Hittite and Tocharian are centum languages, but nevertheless eastern, seemed to support the idea that the centum treatment of the velars

¹⁰ Indo-Iranian was connected to the Corded Ware horizon already by Specht (1934: 29–30), although he suggested that Indo-Iranian developed independently and merged with Corded Ware groups as these migrated to the east.

reflects the archaic situation, whereas satemization is the innovative state (Meillet 1934: 92–93; Burrow 1973: 13–14). Similarly, under the Indo-Anatolian hypothesis, the centum status of Hittite seems to support this notion. However, with the discovery of Luwian and Lycian, which seem to directly reflect a three-velar system (Luw. *z*, Lyc. *s* < **k*, Luw., Lyc. *k* < **k*, Luw. *ku*, Lyc. *k*, *t* < **k*^w, cf. Melchert 1987; 1989), the evidence points in favour of reconstructing a three-way distinction for Proto-Indo-Anatolian (Kloekhorst 2008: 17–18).¹¹ Not only would this suggest that satemization does not, in fact, involve palatalization, but it would also prove that “centumization”, i.e., the merger of **K* and **K*^w, affected Hittite and the remaining centum branches independently. This lends additional credibility to the idea that the centum/satem isogloss is trivial.

Second, it does not make sense to use satemization as evidence for Indo-Slavic specifically, since Albanian and Armenian are also satem languages.¹² Yet, it has been argued that Albanian (Pedersen 1900: 340; Curtis 2018: 1807; Hyllested & Joseph 2022: 239) and Armenian (Macak 2017: 1048–49; Olsen & Thorsø 2022: 205) did not merge **K* and **K*^w, whereas Balto-Slavic and Indo-Iranian did, in which case the merger could be seen as a shared Indo-Slavic innovation (thus Ringe, Warnow & Taylor 2002). This is unlikely, however, because the partial vocalization of **R* to **uR* in Balto-Slavic may have been conditioned by a preceding labiovelar, the outcome elsewhere being **iR* (Brugmann & Delbrück 1897: 453–55; Güntert 1916: 105–7; Vaillant I: 171–72).¹³ Additionally, Balto-Slavic occasionally shows centum reflexes of Indo-European palatovelars, probably caused by depalatalization before certain resonants, which is only partly paralleled by Indo-Iranian (Kortlandt 1978b). In that case, the merger of **K* and **K*^w cannot be a shared Indo-Slavic innovation, but must have been preceded by branch-specific developments.

Moreover, the evidence for a three-way distinction in Albanian (Kloekhorst in prep.) and Armenian (Kortlandt 1975a) is very slim. In the case of Albanian, it is based on the alleged different outcomes of **K* and **K*^w before **e*, **i*. However, the palatalization of **k* > *q*, **g*^(h) > *gj* also affects Latin loans (Curtis 2018: 1807) and clearly belongs to a later phase of the development of Albanian than the palatalization of **k*^w > *s*, **g*^{w(h)} > *z* (cf. de Vaan

¹¹ Melchert (2012) later argued that the Luwian (and Lycian) situation arose through conditional palatalization of **k* < **k*, **k*, and thus is compatible with a centum reconstruction of Proto-Anatolian. However, some cases of palatalization are difficult to explain phonetically, e.g., CLuw. *zanta* ~ Hitt. *katta* ‘down’ < **k̥mto*, Lyc. *sīta* ‘ten’ < **k̥mteḥ*₂ (for the semantics, cf. Melchert 2004: 58). Kimball (1994) and Woodhouse (1998) argue against a Proto-Anatolian three-way system based on the alleged development Luw. *k* < **ḡ*^(h) / *_o*. However, all three etymologies cited in favour of this sound change are problematic: CLuw. *katmarsi(ia)* ~ Hitt. *kammarš-*³ ‘to defecate’ < **ḡod-mr-* is doubtful, since **d*^(h)*n-* yields Hitt. *-tn-* (Kloekhorst 2008: 432); HLuw. loc.sg. *ta-ka-mi-i* /*tgmi*/ ‘earth’, which may alternatively be read /*tgāmi*/ (Kloekhorst 2008: 861), contains a /*g*/ that could perhaps be explained by depalatalization before **m*, as in Balto-Slavic (Kortlandt 1978b); CLuw. *kallar-* n. ‘something evil or unpleasant’ may be a Hittite borrowing, cf. Hitt. *kallar-* adj. ‘inauspicious, unpropitious, baleful, enormous’, but even if it is native, the semantic connection to OIr. *galar* n. ‘disease’, Nw. *galder* ‘swelling in the foot of horses’ is not compelling.

¹² Furthermore, based on genetic evidence, Armenian has been hypothesized to derive directly from the Yamnaya horizon, unlike Indo-Iranian and Balto-Slavic (Lazaridis et al. 2022; Thorsø 2023). Thus, the distribution of the satem branches based on genetics may not correlate with the distribution of the sound change.

¹³ The attested distribution of **iR*, **uR* < **R* in Balto-Slavic far from perfectly reflects the original situation, however, e.g., OCS *žbrq* ‘to swallow, devour’ < **g^wrh₃-*, Lith. *dūmti* ‘to blow’ < **d^mh-*. An alternative explanation is that the distribution of **iR* and **uR* correlates to the full grades **eR* and **oR*, respectively (Mikkola 1913: 100; Trautmann 1923a), but this does not explain the split outcome of vocalized resonants in the first place. It may rather be seen as complimentary to the explanation based on labiovelar conditioning.

2018). Most examples of palatalization of the plain velars are plurals, e.g., Alb. *plak* m. ‘old man’, pl. *pleq*, where the palatalization must be posterior to the monophthongization and apocope of nom.pl. **-oi* > **-i*. Importantly, this palatalization also affects **k^w*, e.g., Alb. *ujk* m. ‘wolf’, pl. *ujq* < **ulk^wo-*. The handful of etymologies where the palatalization of **k* could be primary, e.g., *qoj* ‘to awaken’ < **ki-eh₁-*, cf. Lat. *cieō* ‘to move, stir up’, Gr. κινέω ‘to set in motion, drive away, shake’ (Demiraj 1997: 65; see further Pedersen 1900: 329–330), have alternatively been explained as analogical restorations (Hermann 1907: 47; Kortlandt 1980: 246). Furthermore, the absence of palatalization before **ē* in *kóhē* ‘time’ < **kēs₁ko-* (which shows that **k* > *q* is posterior to **ē* > *o*), is irrelevant, since the word only has Balto-Slavic cognates, rendering the reconstruction of **k* circular. Additionally, it is doubtful whether we would expect palatalization before **ē* in the first place, since all alleged examples of **k^wē*, **g^{w(h)}ē* > *so*, *zo* are unconvincing (cf. Demiraj 1997: s.vv.): Alb. *sórrē* ‘crow’ < **k^wērsnā-* may be onomatopoeic, or reconstructed as **k^wērsnā-*, cf. SCr. *svrāka* ‘magpie’; *zog* ‘bird; nestling’ may be connected to Arm. *jag* ‘little bird, sparrow; nestling’ < **g^huāg^hu-* rather than to Gr. ζῷον ‘living being’; *zórrē* ‘gut, intestines’ has no clear etymology, but a derivation from **g^werh₃-* ‘to swallow’ is semantically doubtful; *zot* ‘god’ is not entirely clear, but is probably derived from **dieu-*. Thus, even if *kóhē* ‘time’ < **kēs₁ko-* were a valid etymology, it would not prove a phonemic distinction between **K* and **K^w*, since there is no solid evidence that **ē* caused palatalization of **K^w*.

The proposed three-way distinction of the velar series in Armenian is based on the absence of evidence for palatalization of **K* and **g^w* before **e*, **i*, which affects **k^w* and **g^{w(h)}*. The phonetic justification for the special treatment of **g^w* is not clear. A similar conditioning is observed in Greek, e.g., Gr. βίος ‘life’ < **g^wi_{h3}-*, although not before **e*, cf. Gr. ἀδελφός ‘brother’ < **g^welb^h-*. As for the absence of palatalization of **K*, Kortlandt (1975a) argues that all examples may be explained as analogical restorations. Importantly, there are also examples of original **k^w* that escaped palatalization in the expected contexts, e.g., Arm. *hing* ‘five’ < **penk^we*.

As for the RUKI rule (Pedersen 1895) as evidence for Indo-Slavic, the problem is that its application in Baltic, Slavic, and Indo-Iranian does not fully overlap (Lipp 2009: 32–38 with lit.). Generally, Indo-Iranian and Slavic apply the RUKI rule consistently (AiGr. I: 299ff; Vaillant I: 28), whereas there are many exceptions in Baltic (Petit 2018: 1649). This has been explained by assuming that the RUKI rule was a dialectal development that did not fully affect Baltic, situated in the western periphery (Stang 1966: 98–99). However, a more straightforward explanation is that RUKI originally operated on a phonetic level and was phonologized independently in the subbranches as a result of the introduction of additional sibilants into the phonology (Andersen 1968: 176; Martinet 1970: 239; Allen 1973: 107).¹⁴ In Baltic, the rule only operates regularly after **r*, and in the case of **i* and **u* only when **s* is followed by **k* (Jakob 2023b). In Indo-Iranian, it operates not only after inherited **i* and **r*, but also after **i* < **H* and **r* < **l* (Lubotsky 2018).

¹⁴ For example, the development **k̑* > *s* in Iranian and Slavic created an opposition between **s* and **š* after **r*, **u*, **k*, **i*, e.g., YAv. *vīša-* n. ‘poison’ < **uis-* vs. *vīs-* f. ‘dwelling’ < **uik-*. Similarly, the merger of **k̑*, **g̑* and **š* before **i* in Proto-Indo-Iranian dissociated **š* from **s*, e.g., Skt. *iṣṭi-* f. ‘search’ < **h₂iš-ti-* vs. *iṣṭi-* f. ‘worship, sacrifice’ < **Hih₂g̑-ti-* next to *astá-* ‘thrown, shot’ < **h₁es-to-* vs. *aṣṭá-* ‘eight’ < **h₃ekt-eh₃-*.

Therefore, while the RUKI rule itself is specific and non-trivial (Beekes 1988: 80; Hock 1991: 442), it is difficult to exclude that it also operated in (Core) Proto-Indo-European but failed to be phonologized in other branches.¹⁵ Thus, there are major caveats associated with both satemization and the RUKI rule as evidence for subgrouping, and neither can be considered to provide compelling evidence for the Indo-Slavic hypothesis.

To sum up, we have seen three major hypotheses on the position of Indo-Iranian within the Indo-European language family: the Graeco-Aryan hypothesis, the primary split hypothesis, and the Indo-Slavic hypothesis. All three go back at least to the 1850s, and, to a greater or lesser degree, all retain proponents in the current literature. In other words, neither hypothesis has been supported by enough linguistic evidence to reach broad acceptance. Narasimhan et al. (2019) connect the hypothesized genetic connection between early Indo-Iranian speakers and Corded Ware populations to the Indo-Slavic hypothesis, with specific reference to satemization and the RUKI rule. However, as the discussion above has shown, these phonological isoglosses do not offer unambiguous linguistic evidence for Indo-Slavic. Yet, the genetic evidence provides an impetus to re-evaluate the linguistic evidence for the Indo-Slavic hypothesis. As we have seen, besides satemization and the RUKI rule, additional evidence for the Indo-Slavic hypothesis has been proposed. In particular, the lexical isoglosses shared by Indo-Iranian and Balto-Slavic have been taken as evidence for a period of dialectal proximity of Pre-Proto-Indo-Iranian and Pre-Proto-Balto-Slavic. However, this material deserves a reappraisal, for several reasons: 1) the bulk of the research is outdated (cf. Schmidt 1872; Arntz 1933) or dismisses large parts of the material without justification (cf. Porzig 1954); 2) the lexical evidence has mainly been studied from a dialectological or wave model perspective, where the distinction between archaisms and shared innovations has not received sufficient attention (cf. Meillet 1908; Porzig 1954); 3) computational studies based on Swadesh-type wordlists leave most of the lexicon out of consideration, as a consequence of this methodology (cf. Kassian et al. 2021).

¹⁵ For a possible reflex of the RUKI rule in Hieroglyphic Luwian, see Rieken (2010).

1.4. Research questions

The main research questions of this thesis are the following:

- A. Do the lexical isoglosses shared by Indo-Iranian and Balto-Slavic support an Indo-Slavic subgroup within Core Indo-European?
 - 1. How many Indo-Slavic lexical isoglosses are there? (Chapter 3)
 - 2. How many of the Indo-Slavic lexical isoglosses are plausible shared innovations? (Chapter 4)
 - 3. In terms of linguistic palaeontology, what does the corpus of Indo-Slavic lexical isoglosses suggest regarding the timeframe and location of the hypothesized Indo-Slavic community? (Chapter 4)
- B. Which scenarios on the prehistoric dispersal of Indo-Iranian are possible based on the evidence from genetics and archaeology? Which scenario best accounts for the linguistic conclusions regarding question A? (Chapter 5)

2. Theory and methodology

2.1. Introduction

As the discussion in 1.3 above has shown, the internal structure of the Indo-European language family has been described using the tree model or the wave model, which are often seen as complementary. In the following sections, the theoretical principles and methodological practices associated with both models will be discussed and evaluated. Special emphasis will be given to lexical evidence in subgrouping methodology. It will be argued that both the tree and wave models have their place, but occupy different stages in the workflow of subgrouping research. Finally, linguistic palaeontology and its role in debates on the homelands of prehistoric linguistic communities will be discussed.

2.2. Phylogenetic subgrouping

The idea to represent the internal structure of the Indo-European language family in the form of a tree diagram goes back to Schleicher (1853; 1861).¹⁶ As indicated by the title of his 1853 paper “Die erste Spaltungen des indogermanischen Urvolkes”, Schleicher envisioned the splits between the branches in migrationist terms, i.e., the splits were caused by physical separation of speech communities. He operated with binary splits and indicated the longevity of branches by their relative length in the diagram. For example, “graecoitalokeltisch” represents a shorter period of unity than “arisch” (i.e., Indo-Iranian), despite the fact that these nodes are on the same level in the family tree (cf. Figure 2).

¹⁶ However, already Rask (1818: 84) used a tree-like diagram of the Celtic languages, and there are even older examples, e.g., by the 17th century scholars Georg Stiernhielm and Georg Hickes (Sutrop 2012).

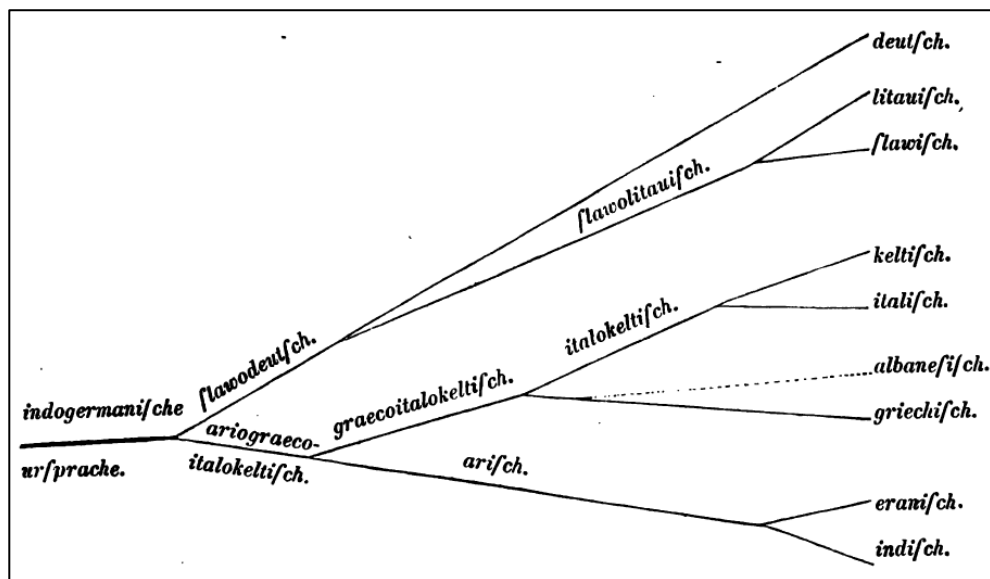


Figure 2. Schleicher's Indo-European family tree (1861).

It has often been remarked that the tree model is too abstract or simplistic to reflect the actual process of diversification of a language family as a historical reality (Hoenigswald 1966; Schlerath 1981; Clackson 2022: 26). Sudden migrations, causing clear-cut splits of speech communities, as Schleicher describes them, are rare. Already in the mid-19th century, scholars like Pictet (1859–1863: I, p. 48) and Schuchardt (1866: 103) argued that linguistic divergence is gradual. This realization was certainly an important motivation behind Schmidt's (1872) wave model (Geisler & List 2013). However, rather than reflecting the complex nature of actual linguistic divergence, the tree model may be seen as a post-hoc representation of the relationship between the branches. In other words, a split in the tree model does not, in most cases, correspond to a sudden split of a linguistic community, but rather to the observable result of a gradual diversification process. As we will see, the methodological strength of the tree model, in contrast to the wave model, lies in its rigidity (Schlerath 1981): it forces us to make explicit hypotheses regarding the phylogenetic relationship between the branches, which can be tested (and falsified) against the data.

2.2.1. The shared innovation principle

A core principle in subgrouping methodology, or phylogenetics, is that subgroups, or clades, should be based on shared innovations, not shared retentions or archaisms (Fick 1873; Leskien 1876; Delbrück 1880; Brugmann 1884; Dyen 1953: 581; Porzig 1954: 55; Greenberg 1957: 49; Hoenigswald 1966; Ringe 2017: 62).¹⁷ An innovation is any linguistic

¹⁷ Although Brugmann is usually credited for formalizing the principles of subgrouping methodology, already Fick (1873: 164) clearly states that subgroups must be based on shared innovations (here in an argument in favour of a European subgroup): "Um den Schluss auf eine ehemalige Spracheinheit aller Europäer wirklich zu begründen,

feature (phonological, inflectional, derivational, lexical, syntactical) of a language that was not present in its immediate ancestor. When two related languages have undergone the same innovation, it either reflects independent developments¹⁸ or a shared development in a common ancestor. By compiling shared innovations of related languages, a family tree can be constructed, each branch or subgroup reflecting a set of shared innovations.

In the terminology of Ringe, Warnow & Taylor (2002), which is borrowed from cladistics, linguistic features may be described as *characters* with variable *states*. A character is an abstraction of phonology, morphology, lexicon or syntax, i.e., a phoneme, morpheme, lexeme, or syntactic structure. A state is the representation of a character in a particular language. For example, the Proto-Indo-European phoneme **p/* is a character that is reconstructed to explain a set of regular sound correspondences in the Indo-European languages. The character **p/* is reflected in the attested languages by different states, such as Latin *p*, Greek *p*, Germanic *f*. Based on the typological principle that *p* > *f* is a more likely sound change than the opposite, we hypothesize that Proto-Indo-European had the state **p*, which may be termed the *ancestral state*.¹⁹ In this example, Germanic shows an innovative state, whereas Latin and Greek continue the ancestral state.

The identification of innovations presupposes that the ancestral state of a character can be determined. In practice, this is often extremely difficult. As discussed in section 1.3 above, the ancestral state of PIE **k̑* has been reconstructed as a palatal/fronted velar or as a plain velar. Depending on the preferred reconstruction, the status of the attested states in the satem languages (e.g., Skt. *ś*, Av. *s* < PIIr. **ć*) as innovations or retentions changes.

müssen die Differenzen zwischen europäischer und arischer Sprache also derart sein, dass die europäische Eigentümlichkeit eine Abweichung von der Ursprache enthält, dann zwingt uns dieselbe allerdings ein einheitliches sprachlich verbundenes Volk als Urheber dieser Umwandlung des früheren Bestandes anzunehmen, und wie uns die Differenz das Faktum der Scheidung verbürgt, so bezeugt die gleichmässige Durchführung der sprachlichen Neuerung sprachlichen Zusammenhang unter den diese Neuerung durchführenden Individuen [emphasis added].” It is possible that the shared innovation principle goes back to even earlier scholarship.

Leskien (1876: vii) argues: “Die Kriterien einer engeren Gemeinschaft können nur in positiven Uebereinstimmungen der betreffenden Sprachen, die zugleich Abweichungen von den übrigen sind, gefunden werden.” Later (p. xxii), in a discussion on Schmidt’s (1872) wave model, Leskien states that “Man bemerke, dass es sich um lauter Verluste einst gemeinsamer indogermanischer Bildungen handelt. Sie beweisen für die nähere oder fernere Beziehung der betreffenden Sprachen nichts.” Further on (p. xxiv), regarding an alleged Indo-Iranian-Balto-Slavic derivational correspondence, he argues that “Die Uebereinstimmung ... beschränkt sich also ... darauf, dass ... in beiden Sprachgruppen eine gleichartige Weiterbildung mit Suffix *-ti-* vorgenommen ist, ein Umstand, dem ich bei der Häufigkeit des Suffixes in beiden keine besondere Bedeutung beilegen kann.” With this, Leskien stresses that subgroups must be based on shared innovations, not shared archaisms or independent innovations.

Delbrück (1880: 135) contends that “nicht jede Gleichheit zwischen zwei Sprachen als argument für eine Urgemeinschaft betrachtet werden kann. [...] [E]s bleiben streng genommen nur gemeinsam vollzogene Neuerungen als beweiskräftig übrig”.

A few years later, Brugmann (1884: 231), in a dedicated methodological paper, concludes that “wirkliche Beweisgründe für die engere Zusammengehörigkeit zweier oder mehrerer Sprachen können nur solche Übereinstimmungen sein, welche Abweichungen von den übrigen Sprachen desselben Stammes sowie zugleich von der allgemeinen Grundsprache sind, also gemeinsam vollzogene Neuerungen”.

¹⁸ Independent developments refer to innovations that are independent in the phylogenetic sense. As such, the term encompasses parallel innovations as well as areal developments, such as borrowing.

¹⁹ In the case of phonemes, the character and ancestral state are often identical, but refer to different aspects of the reconstruction; the character is a representation of the correspondence set responsible for postulating the phoneme, whereas the ancestral state refers to its phonological representation in the protolanguage. For morphological characters, the difference is more obvious; e.g., the 3sg. middle ending is a character with attested states such as Skt. *-te*, *-e*, Gr. *-tai*, *-toi*, Lat. *-tur*. In this case, the reconstruction of the ancestral state is much more debated.

Even if a state that is shared by two languages is decidedly innovative, it is often difficult to determine whether the innovation is shared or independent. Continuing with the centum/satem example, provided that the ancestral state is a three-way system $*\acute{K}$, $*K$, $*K^w$, the merger of $*K$ with either $*\acute{K}$ or $*K^w$ is an evident innovation. However, if Luwian preserves the ancestral three-way system, Hittite must have merged $*\acute{K}$ and $*K$ independently of the other centum languages.²⁰ This calls into question whether the centumization and satemization of the other branches could not also have happened independently (cf. Ringe 2017: 64).

2.2.2. Typology of shared innovations

Different types of characters are generally given different weight for subgrouping purposes (Porzig 1954: 59; Clackson 2022: 25). Innovations in inflectional morphology have been seen as the most significant,²¹ since such morphemes are not easily borrowed, and often alter the morphosyntactic structure of the language (Greenberg 1957: 52; Clackson 1994: 25–26; Klingenschmitt 1994: 236). Yet, Greenberg (1957: 46) cautions that related languages may develop independently in the same direction, since they share the same starting point. Innovations in derivational morphology are also given considerable weight, as new morphemes are unlikely to develop independently. However, they are less resistant to borrowing (Thomason 2001: 70–71). Phonological innovations, i.e., sound changes, are generally ranked lower than morphological innovations, since they are often typologically common and therefore may affect languages independently (Greenberg 1957: 50; Clackson 1994: 20). However, a chain of shared changes that feed each other seems more significant (Greenberg 1957: 51). An advantage of a particular type of phonological innovation, namely phonological mergers, is that their directionality is provable (Hoenigswald 1966). Less trivial sound changes are given more weight, but judging which sound changes are trivial often becomes subjective. Syntactic innovations are often disregarded for subgrouping purposes,²² since the risk of chance resemblance is high, and since syntactic structures of the protolanguage are more difficult to access with the comparative method than phonological and morphological features (Clackson 2007: 157ff; 2022: 23; Gildea, Luján & Barðdal 2020). For some syntactic characters, e.g., basic word order, the number of possible states is so limited that the risk of independent innovations is high (cf. Ringe & Eska 2013: 262).

2.2.3. Lexical characters as evidence for subgrouping

Lexical innovations have been given relatively little importance for inferring Indo-European phylogeny (Leskien 1876: xxiii; Delbrück 1880: 135; Hoenigswald 1966: 8). According to Meillet (1908: 126), this is because there are no two branches that do not share at least a few unique lexical correspondences. Porzig (1954: 59) argues that lexical

²⁰ Here and elsewhere in this work, the validity of the primary branches of Indo-European is taken for granted.

²¹ Cf. Schleicher (1858b: 12): “...ich lasse nach einem bei mir feststehenden grundsatz nur den grammatischen ban als masstab der verwandtschaft zweier sprachen eines und desselben sprachstammes gelten und betrachte andere übereinstimmungen nur als willkommene zuthat...”

²² Notable exceptions include Longobardi & Guardiano (2009) and Longobardi et al. (2013).

correspondences only show that two branches were in contact, i.e., developed from contiguous dialect groups, but not that they form a subgroup in the strict sense. In Olander's (2022) volume on Indo-European phylogeny, lexical evidence is either seen as complementary to phonology and morphology, or disregarded, with the exception of Olsen & Thorsø (2022: 211–12), who take lexical innovations as the main evidence for a Graeco-Armenian subgroup (see also Martirosyan 2013, who interprets this as a dialectal grouping, however).

The main problem associated with lexical evidence in subgrouping methodology is that it is unclear if and how lexical characters can be defined in a way that makes them relevant for subgrouping purposes. There are essentially two options:

1) *Character = etymon*: If the lexeme itself is the character, e.g., **h₂erh₃-tro-* 'plough', all branches attesting the lexeme share the same state. However, as Ringe, Warnow & Taylor (2002: 71) argue, the branches that do not attest **h₂erh₃-tro-* must count as having different states, since they could have lost the lexeme independently. The consequence is that such a character is compatible with any tree structure, i.e., it can always be back-projected to the root of the tree, and is thus uninformative for subgrouping (cf. Kortlandt 2016). This problem was recognized by Porzig (1954: 58–59), who argued that isoglosses must be based on two positive states rather than presence and absence, which requires the use of semantic concepts rather than reconstructed etyma as characters. Peyrot (2022) describes the problem in terms of lack of *identifiability*. This term refers to the methodological criterion that "the linguistic element adduced as a shared innovation in the lower node should be clearly identifiable in the higher as well as in the lower node" (Peyrot 2022: 90). In other words, if a feature such as a lexeme is absent from an attested language, it is not identifiable, because we cannot determine whether it was lost in that language or never existed. By implication, the lexeme is not identifiable in the common ancestor; it may or may not have existed there. The result is that the ancestral state cannot be determined.

It is important to realize that identifiability is not only a concern regarding lexical characters. As exemplified by Peyrot (2022: 91), the comparative and superlative suffixes of, e.g., Greek and Indo-Iranian, are unattested in Anatolian and Tocharian. While one may be inclined to analyse them as innovations of the non-Tocharian Core Indo-European branches, it cannot in principle be excluded that these morphemes were lost in Anatolian and Tocharian. Therefore, in the strictest application of the identifiability criterion, the comparative and superlative suffixes are uninformative for the phylogeny. Many morphological characters in Ringe, Warnow, and Taylor (2002: 117–18), such as the augment and thematic optative, suffer from the same problem.

2) *Character = semantic concept*: If, as Porzig argued, semantic concepts are used as characters (thus, e.g., Ringe, Warnow & Taylor 2002; Kassian et al. 2021), e.g., PLOUGH, each branch that attests the same formation for a particular semantic concept is assigned the same state. As long as every branch has a word for PLOUGH, the identifiability criterion is met.²³ However, this approach does not resolve the problem of determining the ancestral state, i.e., which state should be reconstructed to Proto-Indo-European for that particular

²³ In reality, it is not necessarily the case that each branch attests a word for a given semantic concept.

semantic concept. Furthermore, it restricts the object of study to basic vocabulary, since this is the only part of the lexicon where all languages are expected to attest one basic lexeme for each semantic concept, based on linguistic typology.²⁴ For non-basic vocabulary, such as PLOUGH, or more abstract concepts (e.g., BEAUTY, DOWNWARDS), languages show great variation in how semantic concepts are mapped. Therefore, using such concepts as characters is not justifiable.

However, even if exclusively basic vocabulary is considered, it is far from straightforward to accurately determine which lexeme occupied a certain basic vocabulary slot in modern languages, let alone in ancient languages or in the protolanguages of each branch (cf. the different approaches in Dyen, Kruskal & Black 1992; Kassian et al. 2021; Heggarty et al. 2023). As Peyrot puts it, “several etyma may have similar, overlapping or even identical meanings, and it is therefore difficult to prove that a certain meaning came to be expressed with a different etymon” (2022: 91).

Additionally, from a theoretical perspective, it is questionable whether the replacement of the lexical form mapped onto a particular semantic concept is in itself a significant process, comparable to a sound change or replacement of an inflectional ending, especially if the form itself is not a unique formation. Consider, for example, the character SWIM in Kassian et al. (2021: S86). Indo-Iranian and Balto-Slavic are argued to share the innovative state **pleu-* ‘to swim’, as opposed to, e.g., Gr. *véō* ‘to swim’. Yet, Greek also attests *περιπλέω* ‘to bypass while sailing or swimming’. This implies that the meaning ‘to swim’ of **pleu-*, which elsewhere means ‘to float, flow’ (cf. LIV: 487), may be archaic. In Kassian et al.’s methodology, however, it is the fact that Indo-Iranian and Balto-Slavic use the same lexical material as the basic word for the same semantic concept that counts as a shared state, irrespective of whether a cognate is attested elsewhere. Even more questionable is the treatment of the basic vocabulary item FIRE in Kassian et al. (2021: S41–42). Although Indo-Iranian, Balto-Slavic, and Latin all attest reflexes of **h₁ngʷni-* ‘fire’, only the former two are argued to share the same state. Latin *ignis* ‘fire’ is coded as a separate state, since the other Italic languages attest reflexes of **peh₂ur/n-* ‘fire’, which is argued to be the ancestral state, as it is found in Anatolian (e.g., Hitt. *pah₂hur-/pah₂huen-*). Therefore, the replacement of **peh₂ur/n-* by **h₁ngʷni-* in Latin is argued to be a post-Proto-Italic development, not shared with Indo-Iranian and Balto-Slavic. However, this argumentation fails to take into account that the alleged replacement of the basic word for fire could be an independent process in Indo-Iranian and Balto-Slavic as well. Thus, this methodology clearly represents a departure from the principles of the traditional comparative method.

In any case, for lexical comparison of words outside of the basic vocabulary, we are forced to retain the etymon, or lexeme itself, as the defining unit of the lexical character (*character* = *etymon*), as opposed to the semantic concept (*character* = *semantic concept*). As we have seen, this methodology carries with it two problems. First, the possibility of loss in one or several branches prevents identification of the lexical character in those

²⁴ The notion of “basic vocabulary” is by no means unproblematic or objective, but cf. Tadmor, Haspelmath & Taylor (2010) for an empirically motivated basic vocabulary list.

branches. By extension, the ancestral state of lexical characters (which is limited to presence vs. absence) cannot be determined.

To address the difficulty of determining their ancestral state, lexical characters must be divided into subtypes, each with different limitations.

1) For root isoglosses, i.e., when branches share a unique root but no verbal or nominal derivatives, their status as archaisms or innovations is in general not possible to determine. The default assumption is that they are archaisms. An exception is if it can be demonstrated that a root is derived from another root by a suffix or *root extension*.

2) In the case of nominal and verbal derivatives, an important factor is whether it is reasonable to believe that the root was synchronically productive in the subgroup from which the branches that attest the formation are hypothesized to be descended. If the root is isolated, i.e., not found in any other formations, it may indicate, though not prove, that the shared derivative is an archaism. If the root has a solid Indo-European etymology, i.e., is found in other branches, it becomes more likely, although by no means proven, that the shared derivative is an innovation. Another important factor is the productivity of the derivational morphology in question. Shared formations with derivational morphemes that are highly productive may indicate independent innovations. Conversely, rare or obscure derivations may indicate archaisms.

3) Semantic isoglosses, i.e., when branches share a specific meaning of a lexeme attested in other branches, are powerful in the sense that they more easily fulfil the identifiability criterion. However, the directionality of the semantic change, and thus the ancestral state, is not always possible to determine.

4) Finally, shared lexemes may reflect borrowings from other (non-Indo-European) languages. Such loanwords are most plausibly identified by irregular correspondences in other Indo-European languages by or violations of Proto-Indo-European phonotactics (Meillet 1908–1909; Cuny 1910; Jakob 2023a; Thorsø 2023; Wigman 2023).

The list above represents some general considerations, but in practice, possible shared lexical innovations must be analysed case-by-case. As will be shown in Chapter 3, a number of plausible innovations may be found among the Indo-Slavic lexical isoglosses, despite the numerous problems and caveats presented here.

To address the problem of identifiability of lexical characters (as well as characters more broadly), it is important to realize that a single character is rarely informative for the phylogeny of the whole family. For example, suppose a language family with five branches *ABCDE*. For a character *xy*, state *x* is attested in branches *A* and *B*, and can be shown to be a shared innovation as opposed to state *y*, attested in branches *C* and *D*. Branch *E* attests neither state *x* or *y*. Based on this situation, state *x* suggests that *A* and *B* derive from a subgroup to the exclusion of *C* and *D*. However, several scenarios are possible for branch *E*: 1) it could theoretically have taken part in the innovation of *x*, but subsequently lost it, in which case *E* would belong to the same subgroup as *A* and *B*, 2) it may have lost the ancestral state *y*, or 3) *E* had neither state *x* or *y*, in which case *y* is rather a shared innovation of *ABCD*, after which *AB* replaced *y* with *x*. Ideally, by combining the evidence of a large number of characters, each informing on different subsets of the branches of the language family, a true phylogeny may be inferred.

The above considerations notwithstanding, lexical evidence also has its advantages over morphology and phonology. New lexemes develop continuously through derivational processes and language contact, without altering the system of the language as a whole. Since the lexicon consists of a large number of discrete units, even a short-lived subgroup would be expected to show lexical innovations. Therefore, lexical isoglosses have the potential of disentangling phylogenetic relationships that cannot otherwise be defined by morphological or phonological isoglosses, either because there were none or because they were obscured through later developments. Furthermore, lexical evidence indirectly encompasses derivational morphology and might reveal innovative patterns of derivation. Additionally, the lexicon can reveal material conditions of the speakers, such as familiarity with flora and fauna or technological innovations, which with the methodology of linguistic palaeontology can be compared with the archaeological record to trace subgroups in time and space (cf. 2.5).

2.2.4. Quantity of shared innovations in subgrouping

Next to the shared innovation principle, discussions on subgrouping methodology generally assert that subgroups should be posited only when the number of shared innovations is high enough (Brugmann 1884: 253; Dyen 1953: 581). This is to avoid reliance on a small number of innovations that may in fact have been independent (Porzig 1954: 55). With respect to lexical innovations, a large number is argued to be especially important, since they are not given much weight individually (Clackson 1994: 25).

However, the required number of shared innovations is difficult to define objectively. As Porzig (1954: 55) notes, Brugmann & Delbrück (1897: 20–21) present “only” seven shared innovations as evidence for Balto-Slavic.²⁵ Clackson (1994: 199–200) concluded that the five lexical innovations (among 25 lexical isoglosses) he found in Greek and Armenian (with no supporting phonological or morphological innovations) were too few to support a Graeco-Armenian subgroup. Holst (2009: 53–54), on the other hand, argues that Clackson’s conclusion is too conservative, and that the aggregate of evidence (including less convincing cases of shared innovations) rather tips the balance in favour of Graeco-Armenian.²⁶ These conflicting interpretations are mostly a consequence of different approaches to subgrouping: in Clackson’s view, the paucity of lexical innovations is not only problematic due to the ever-present possibility that they were after all independent innovations, but also because such innovations would not have altered the structure of the ancestor of Greek and Armenian sufficiently to justify calling it a subgroup. Rather, Clackson attributes such shared innovations to dialectal developments within Proto-Indo-European. Holst (2009: 52) describes such statements as “Wischi-Waschi-Klassifizierungen”, and calls for more explicit conclusions in terms of subgrouping. This

²⁵ Although, in their defense, the list is called “Einige Kennzeichen des baltisch-slavischen Zweigs”, which implies that additional shared innovations may have been excluded.

²⁶ However, Holst (2009: 65) ultimately operates with a Balkan Indo-European subgroup, where Greek is closer to Albanian, Macedonian, and Phrygian than to Armenian. This is not insignificant for the interpretation of Clackson’s material, since one of his five Graeco-Armenian lexical innovations (**wes-nu-* ‘to clothe’) is shared to the exclusion of Albanian, cf. Alb. *vesh* ‘to clothe’ ~ Skt. *vāsāyati* ‘id.’.

debate illustrates the difficulty associated with the quantitative assessment of shared innovations.

A related question is whether a large number of lexical isoglosses is significant even if not all of them can be shown to be innovations. This is essentially what Holst (2009: 54) alludes to regarding Clackson's (1994) compilation of Graeco-Armenian isoglosses: "Wenn aber große Datenmengen in eine Richtung weisen, dann ist dies aussagekräftig." Holst's statement rests on the assumption that similarity (= a high number of lexical isoglosses) can serve as a proxy for subgroupiness (= a high number of shared innovations), which need not be the case (Holm 2003). Moreover, the problem is again how large that number must be to be significant in this regard, i.e., not a result of chance. Ideally, all Indo-European lexemes should be classified according to which branches attest them, to determine whether certain branches share disproportionate numbers of lexical isoglosses. Even with such a dataset, however, the Indo-European languages are not equal in terms of time depth, wealth and type of attestation. Again, due to lexical replacement, languages that are abundantly attested (modern and/or with rich ancient literature) have a higher chance of preserving more lexical material. Some languages tend to be more conservative, whereas others are known to have undergone heavy lexical replacement. This makes it difficult to assess to what extent the number of isoglosses shared by various branch pairs reflects actual relatedness.

2.2.5. The Indo-Iranian bias

As discussed above, several methodological constraints apply to the distinction of lexical innovations from archaisms. On top of these, however, progress has been hindered, especially with regards to Indo-Iranian, by the practice of back-projecting all Indo-Iranian lexemes with cognates in other branches to Proto-Indo-European (e.g., Scherer 1952: 6–7), without considering the possibility that not all such cases need necessarily be archaisms. I call this the Indo-Iranian bias.

For example, Mallory & Adams (1997; also Mallory 2013; 2019) reconstruct any lexeme to Proto-Indo-European that has cognates in at least one European and one Asian branch (which here means Indo-Iranian and Tocharian).²⁷ Thus, the principle has a clear methodological purpose, namely to account for the probability that most Proto-Indo-European words are not retained in all the branches. To avoid back-projecting words attested in geographically contiguous branches, for which the possibility of post-Proto-Indo-European developments increases, the geographical distance between Indo-Iranian (+ Tocharian) and the rest of the non-Anatolian branches is invoked to make the reconstruction more plausible (cf. also Gaitzsch & Tischler 2017). While this is not entirely unreasonable per se, it is not surprising that, with this methodology, Indo-Iranian will have preserved the largest number of Proto-Indo-European lexemes, since a cognate in any of the seven "European" branches leads to back-projection. Yet, while a larger geographic spread might make it more likely that a word goes back to Proto-Indo-European, it does not prove it, since branches that are now far apart may have been closer in prehistory, or even part of

²⁷ This is one of two possible criteria for Proto-Indo-European reconstruction in Mallory and Adams (1997): the other is attestation in Anatolian and any other branch, since they accept the Indo-Anatolian hypothesis.

a subgroup after the split of (Core) Proto-Indo-European. In fact, this methodology introduces a bias in the phylogeny, since it implicitly assumes a primary split between Indo-Iranian and the European branches. The result is that any potential evidence for a subgroup consisting of Indo-Iranian and a European branch, such as Balto-Slavic, is rejected out of hand.

2.3. Dialectal subgrouping

As mentioned above (p. 4, fn. 5), Pictet (1859–1863: I, p. 48ff) argued that linguistic divergence is gradual. He used an abstract geographical model (cf. Figure 3) to describe the dispersal of the Indo-European branches from a common origin. The model implies a period of dialectal differentiation where the branches gradually emerged from what was once a unified Proto-Indo-European language.

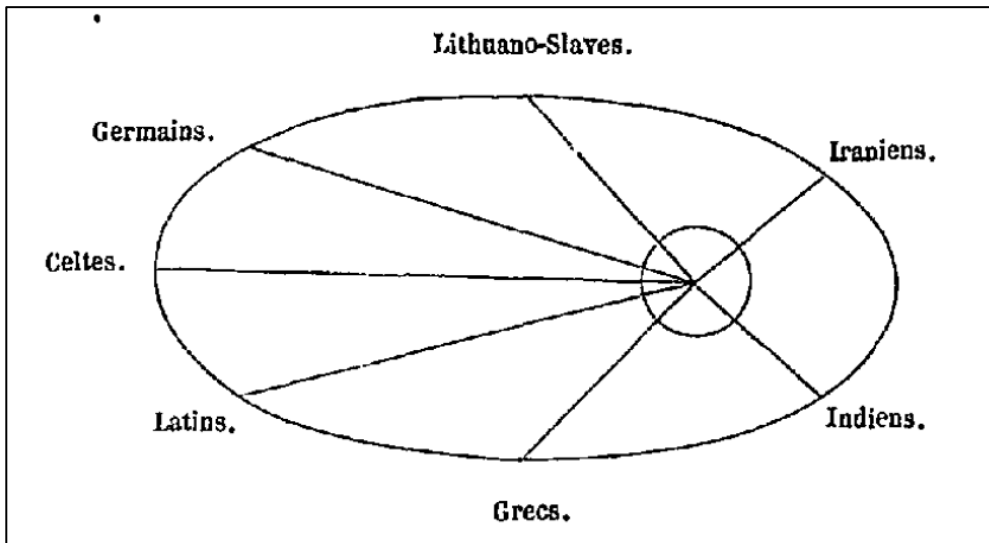


Figure 3. Pictet's divergence model (1859).

Schmidt (1872) formulated the wave model as a direct reaction to Schleicher's (1861) tree model.²⁸ Based on a rich dataset of overlapping lexical isoglosses shared by various combinations of Indo-European branches, Schmidt argued that it was not possible to view the diversification of the family in terms of splits from a common source. Instead, the branches reflect the remnants of a prehistoric dialect continuum, which was broken up when centres of innovation emerged at various points in the continuum, gradually making certain dialects more similar, and others more differentiated. This process can be conceived of as a stairway, where the steps become bigger over time.

²⁸ "Wollen wir nun die verwandtschaftsverhältnisse der indogermanischen sprachen in einem bilde darstellen, welches die entstehung ihrer verschiedenheiten veranschaulicht, so müssen wir die idee des stammbaumes gänzlich aufgeben. Ich möchte an seine stelle das bild der welle setzen, welche sich in concentrischen mit der entfernung vom mittelpunkte immer schwächer werdenden ringen ausbreitet" (Schmidt 1872: 27).

Meillet (1908) adopted the premises of Schmidt's wave model, but focused on phonological and morphological isoglosses to establish dialectal groups among the branches of Indo-European. Importantly, Meillet based these groups on shared innovations, just like subgroups in the tree model. His most important result was that the branches that share innovations are geographically contiguous, which was interpreted as evidence that the relative position of the branches reflects the relative position of prehistoric Proto-Indo-European dialect areas (Meillet 1908: 10–11, 134–35).

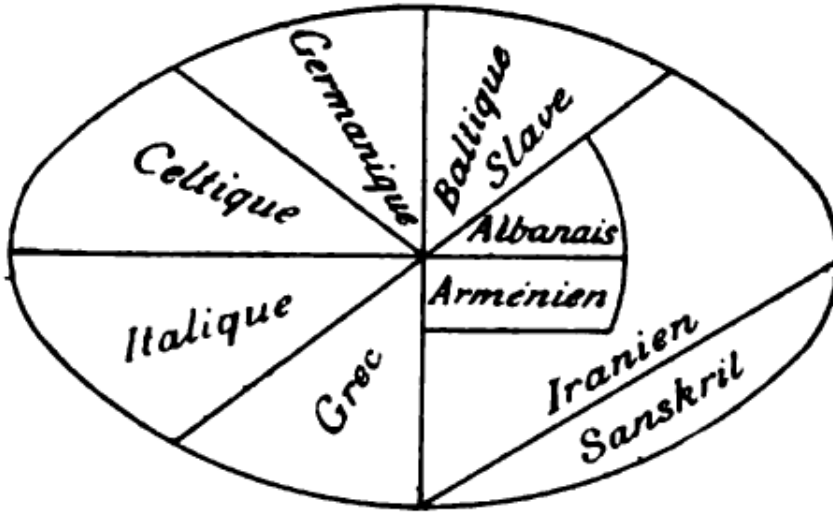


Figure 4. Meillet's Indo-European dialectal model (1908).

Bonfante (1976, reprint of 1931 original) reached a similar conclusion, supporting a fundamental east-west division corresponding roughly to the centum/satem isogloss, with Greek and Balto-Slavic occupying intermediate positions. Bonfante (1976: 116–17) further argued that apart from Celtic and Indo-Iranian, any Indo-European branch can share isoglosses with any other branch, without overlap in geographically intermediate branches. This is represented in the following model (Figure 5):

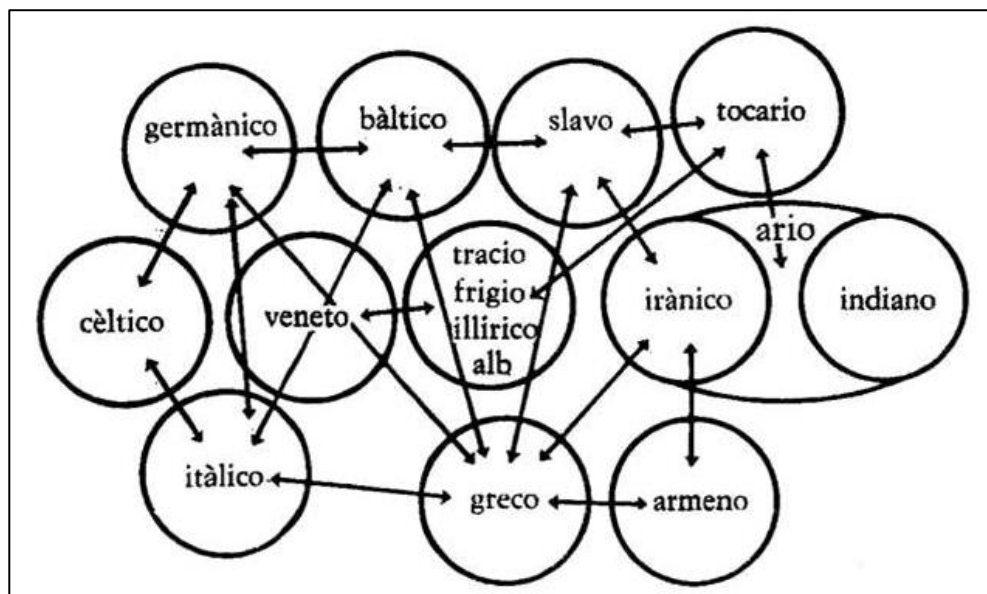


Figure 5. Bonfante's Indo-European dialectal model (1976/1931).

Other dialectal models represent the isoglosses themselves, rather than just the relative position of the branches, cf. Figure 6 (from Bloomfield 1935: 316) and Figure 7 (from Anttila 1972: 305). It should be noted that the authors of these models do not claim to present a complete picture of Indo-European dialect relationships, but they show that Meillet's methodology has had a lasting impact on Indo-European studies.

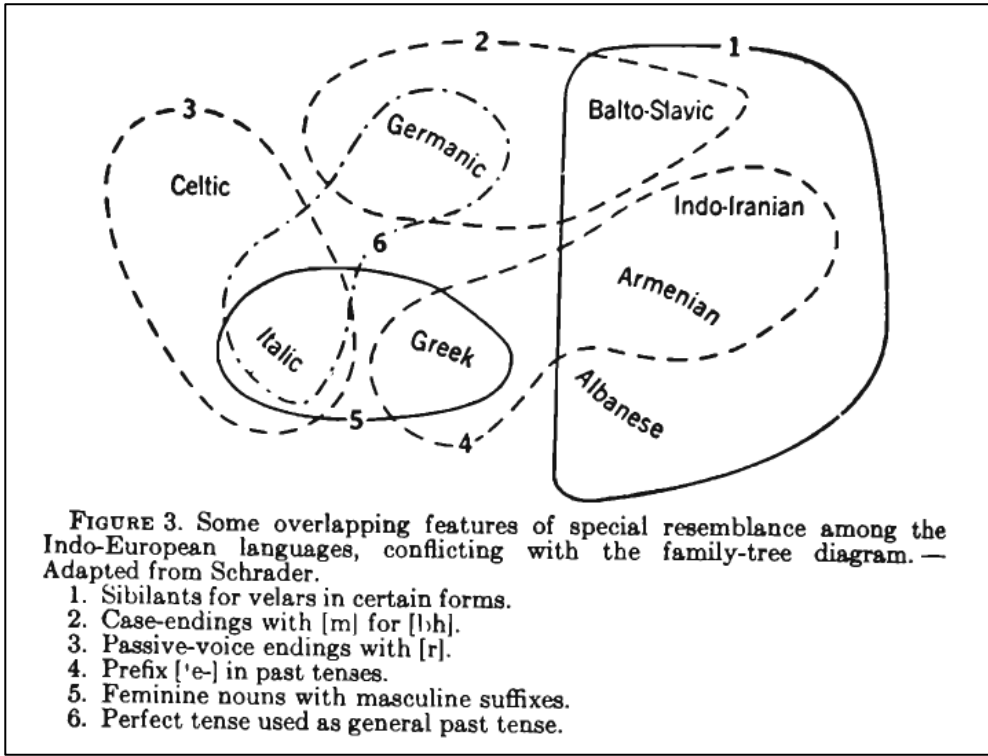


Figure 6. Bloomfield's Indo-European dialectal model (1935: 316).

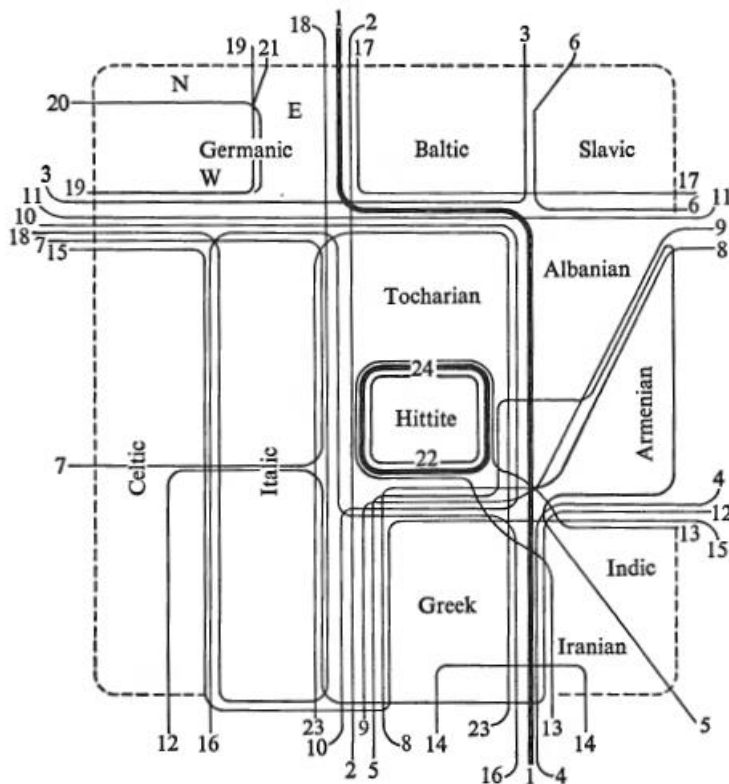


FIGURE 15-2. A dialect map of the Indo-European languages.

DEFINITIONS OF THE ISOGLASSES

- | | |
|--|--|
| 1. centum satem [right] (§ 11.12) | 15. secondary endings (without no. 10 -i) [below] (§ 19.10) |
| 2. -ss- -st-, -tt- [right] | 16. feminine nouns with masculine e.d.-ings [inside] |
| 3. aoe a, āō ō [inside] | 17. -ad 'ablative' 'genitive' [inside] |
| 4. eao a [inside] | 18. new tense system from perfect [inside] (Chapter 12) |
| 5. s h [inside] | 19. umlaut [inside] (§ 4.5) |
| 6. CVRC CRVC [inside] (§ 4.18) | 20. -ww-, -jj- stop + w, j [outside] |
| 7. k ^w p [inside] (§§ 18.13, 18.16) | 21. -ggj- -ddj- [right] (no. 20) |
| 8. e- ø 'past' [left, outside] (§ 19.10) | 22. laryngeals as h's [inside] (§ 12.4) |
| 9. -osyo 'genitive' [right, inside] | 23. uncontracted reflexes of sequence *yH [inside] |
| 10. -r -i 'present' [right, outside] (§ 19.10) | 24. unit pronouns particles + enclitic pronouns [inside] (§§ 19.8, 19.9) |
| 11. -m- -bh- 'case marker' [below] | |
| 12. -to- -mo- 'ordinal' [below] | |
| 13. -u 'imperative' [inside] (§ 19.10) | |
| 14. protī poti 'preposition' [inside] | |

Figure 7. Anttila's Indo-European dialectal model (1972: 305).

The advantage of the wave model and dialectal models above is that they allow more complex interrelations between branches to be represented, as opposed to the sharp splits of the tree model. Since dialect continua are the rule rather than exception in the historical period, it may be argued that dialectal models more accurately reflex the reality of linguistic

divergence in prehistory. This was certainly the motivation behind Meillet's (1908) study of the internal relationships of the Indo-European language family.

However, the wave model is not only motivated by typological-theoretical considerations: for many proponents, the motivation stems directly from the data. According to Bloomfield (1935: 317), "scholars, who insisted upon the family-tree diagram, faced an insoluble problem", since the discovery of more and more overlapping isoglosses did not allow the Indo-European branches to be neatly divided into subgroups. Instead, explaining such isoglosses required the assumption that a branch could undergo shared innovations with different branches independently.

Yet, the alleged overlapping innovations usually cited are not unambiguous. For example, Bloomfield (1935: 315) points out that the shared instrumental-dative endings in **-m-* of Germanic and Balto-Slavic contrast with endings in **-b^h-* of the other branches (cf. Schleicher 1858b: 13; Leskien 1876: 157), which conflicts with the centum/satem isogloss that otherwise divides Germanic and Balto-Slavic. However, even if we accept Bloomfield's premise, i.e., that Germanic and Balto-Slavic share an innovative state here,²⁹ the ancestral state is not straightforwardly reconstructed. Hirt (1895a) argued that both endings existed in the protolanguage with different function. In this case, the generalization of either one in the branches may reflect independent innovations (Pronk 2022: 280). As for the centum/satem isogloss, the discussion in 1.3 above has shown that its value for subgrouping is limited, since the ancestral state is ambiguous, preventing us from proving beyond reasonable doubt that the satem languages have undergone a shared innovation.³⁰ In contrast to Meillet and Bloomfield, Anttila's (1972: 305) model (Figure 7 above) makes no attempt to distinguish archaisms from shared or independent innovations. Consequently, it does not demonstrate the need to assume overlapping innovations to account for the relationship between the branches.

A further example of an alleged overlapping innovation is Meillet's (1908: 57–61) discussion on the development of the Proto-Indo-European dental cluster **tt*. Since the reflex **ss* shared by Italic, Celtic, and Germanic bears the least resemblance to the Proto-Indo-European reconstruction, Meillet interprets this as a shared innovation, which may well be the case. However, the development to **st* in the eastern branches, which Meillet considers "moins instructive, bien qu'encore notable", since it correlates with his idea of

²⁹ The main argument for this is OCS dat.sg. *tebě* 'to you', showing that Balto-Slavic too retains an ending in **-b^h-*, which due to its marginal position may be considered a relic of an older inflectional system.

³⁰ All isoglosses mentioned by Bloomfield (1935: 316) turn out to be uninformative: 1) Satemization; 2) Case-endings with **-m-* for **-b^h-* (cf. above); 3) Middle endings with **-r*. These are archaic, given that they are found in Anatolian. Since **-r* is reflected in the Indo-Iranian 3pl. but lacking from the Celtic 2pl., the ancestral system cannot be reduced to featuring either a marker **-r* or **-i* (cf. Beekes 2011: 268–69); 4) The augment **h₁e-*. The function of this morpheme is not identical in the branches that have it. This suggests that **h₁e-* was grammaticalized independently in the branches, in which case the branches that do not show the augment may have lost it. Furthermore, it has been argued that Anatolian preserves traces of the augment (Norbruis 2021: 209ff); 5) Feminine nouns with masculine suffixes. Rather than reflecting an innovation, such cases surely go back to the Proto-Indo-Anatolian gender system, which (like Anatolian) did not include the feminine gender; 6) Perfect tense used as general past tense. This is a typologically common change (also in Classical Sanskrit, for example) that need not be a shared innovation of Germanic and Italic, especially since these categories are morphologically divergent in the branches (e.g., Italic perfect resulting from a merger of the Proto-Indo-European perfect and aorist).

shared developments in contiguous branches, turns out to be uninformative. First, the change from **tt* to **tst* is shared with Anatolian and therefore reflects the ancestral state, cf. Hitt. 2pl.pres. *azzaštēni* ‘you eat’ < **h₁ed-t^o*. In Indo-Aryan and Iranian, the outcome of **tst* (Skt. *-tt-*, Av. *-st-*) is posterior to branch-specific post-Proto-Indo-Iranian developments, i.e., Indo-Aryan loss of **s* between stops, cf. Skt. 3sg.aor. *ābhakta* < **Ha-b^hak-s-ta* from *bhaj-* ‘to distribute’, and Iranian loss of **t* before **s*, cf. YAv. *masiia-* m. ‘fish’ ~ Skt. *mátsya-* ‘id.’ < **matsia-*. Unlike Iranian, in Greek, the development of **tst* > στ is not identical to the development of **ts*, which is retained in some dialects (cf. Cretan αναδαζαθαι from δατέομαι ‘to divide’).³¹ Based on these considerations, the evidence points to independent innovations in Greek and Indo-Iranian (thus also Porzig 1954: 78) and does not contradict the group defined by satemization, which Meillet (1908: 51) takes as a shared innovation.

One case where the wave model seems necessary to disentangle the internal structure of a language group is the Germanic branch (cf. Agee 2021). On the one hand, North and East Germanic share Holzmänn’s law, causing fortition of **-jj-* and **-ww-*. On the other hand, North and West Germanic share several innovations, such as deictic pronouns in **-si* and introduction of secondary diphthongs in strong verbs (Kroonen & Hansen 2022: 159). While the value of Holzmänn’s law for subgrouping has been questioned (Rasmussen 1990), it seems plausible that it spread in a Proto-Germanic dialect continuum, after which Northwest Germanic formed a subbranch defined by a large number of shared innovations (Kroonen & Hansen 2022: 160).

However, applying a wave model perspective to the ten branches of Indo-European is different from applying it to Germanic, which has only three subbranches and more shallow time depth. Thus, while the typological-theoretical motivation behind the wave model is sound, much remains uncertain regarding the extent to which it is actually necessary to apply it to the diversification of Indo-European. It seems a fair assessment that the inclination to abandon the tree model for the wave model has not been based on the strength of one or a few plausible examples of overlapping innovations (since the ones discussed above generally do not stand up to scrutiny). Rather, the observation that so many *possible* overlapping shared innovations are found in the first place has led to the suspicion that the tree model imposes artificial constraints on subgrouping (i.e., the disallowance of overlapping shared innovations) that do not reflect the reality of linguistic diversification.

The problem is that once the wave model is accepted, the distinction between shared and independent innovations becomes less important (e.g., François 2014: 177, who deliberately does not distinguish between them), since the model can easily accommodate overlapping innovations. As Ringe (2017: 65) puts it, “[a] major weakness of the dialect geography model is that it is difficult to falsify; new evidence that is at variance with the evidence already in hand can often be accommodated on an abstract dialect “map” without major revisions”. Therefore, Ringe & Eska (2013: 263) argue that “...the *Stammbaum* hypothesis is always preferable *as a first hypothesis* because it is falsifiable”.

³¹ According to Norbruis (2023), the regular outcome of **tst* in Greek is rather -σθ-, in which case it would be different from Iranian altogether.

In this sense, the wave model is secondary to the tree model in the workflow of subgrouping research. If (or rather, when) efforts to infer clear-cut splits in the family tree fail, wave-like developments may be assumed for those shared innovations that seem to contradict the tree structure. Both methods are – or should be – based on the shared innovation principle, but only the wave model allows overlapping shared innovations.

2.4. Hybrid models

Already Leskien (1876: xii) saw the tree and wave models as complementary rather than contradictory, describing different aspects of language divergence and relatedness. For this reason, attempts have been made to devise a hybrid model that eliminates the shortcomings from which each model suffers on its own.

Meid (1975) proposed a model in which the branches of Indo-European descend not from a uniform protolanguage but rather from dialectally and chronologically diverse varieties of the protolanguage. To the Early Indo-European (*Frühindogermanisch*) layer belong features where all branches agree. Middle Indo-European (*Mittelindogermanisch*) and Late Indo-European (*Spätindogermanisch*) refer to less archaic stages with increasing dialectal differentiation. Anatolian split off before the Late Indo-European stage, but the remaining dialects are not argued to form a subgroup, because they did not innovate sufficiently together, rather forming a dialect continuum. Schlerath (1981) criticized Meid's approach, on the grounds that the comparative method by definition produces (at least in theory) a chronologically and dialectally uniform protolanguage. Therefore, Meid's model makes assumptions about Proto-Indo-European that, while not themselves implausible, do not follow from the comparative method, and thus cannot be falsified.

Gamkrelidze & Ivanov (1995: 363) present a hybrid “areal-genetic” model (cf. Figure 8), which follows Meid's division of the protolanguage into three stages, the latter two being dialectally differentiated. Later, the non-Anatolian part of the family splits into dialectal subgroups that in some cases nevertheless continue to innovate together (as in the case of Armenian, Indo-Iranian, and Balto-Slavic), long after what may be termed “dialectal Proto-Indo-European”. However, in this model, it is unclear why certain innovations are treated as independent and others as shared by branches that had already split in the sense of the tree model. For example, the outcome of the dental clusters in Italic, Celtic, and Germanic (*ss) is treated as independent innovations that have no implications for subgrouping, since the Italic development is argued to be posterior to Lachmann's Law (Gamkrelidze & Ivanov 1995: 356). Conversely, satemization is taken as an areal shared innovation at chronological level 6 (postdating the split of Aryan-Greek-Armenian and Balto-Slavic-Germanic), even though it is argued to be posterior to the vocalization of syllabic resonants at level 5 (Gamkrelidze & Ivanov 1995: 364). By treating relative chronology so inconsistently as a tool for distinguishing between shared and independent innovations, the model becomes difficult to falsify.

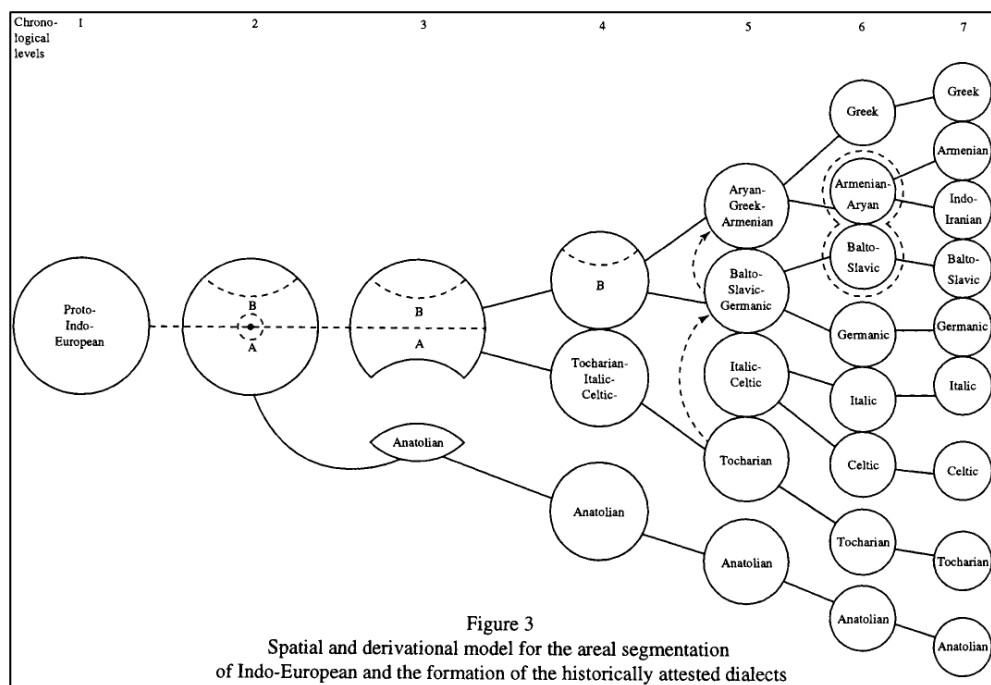


Figure 8. Gamkrelidze & Ivanov's Indo-European areal-genetic model (1995: 363).

When branches share only a small number of innovations, Dyen (1953: 581) argues that this reflects shared dialectal features of the protolanguage, whereas a high number of shared innovations warrants the postulation of a subgroup. Similarly, Clackson (1994: 17) states that “[t]he difference between dialect and sub-group is therefore one of time and degree”. This approach is similar to Leskien’s (1876) and Meid’s (1975) models and is hybrid in the sense that it recognizes both wave-like, dialectal developments and tree-like splits as important factors in language diversification. However, if the difference between wave-like dialect groups and tree-like subgroups were only one of degree, I see no reason why both types could not be represented in the tree model. Schleicher (1861) intended the length of a branch in his tree to reflect its longevity and by implication the number of shared innovations that the subgroup is based on. Thus, rather than a difference in degree, the fundamental difference between the models lies, as we have seen, in whether or not they accommodate overlapping shared innovations.

Ross (1997) developed a hybrid model that distinguishes “language fission” (= tree-like splits), cf. Figure 9, from “linkage breaking” (= breaking of a dialect continuum). The latter is preceded by “lectal differentiation”, i.e., a period when overlapping innovations develop in a dialect continuum, cf. Figure 10. Both processes, termed “speech community events”, are based on shared innovations, but only linkage breaking involves overlapping innovations. Linkage breaking is of course very similar to Schmidt’s (1872) original formulation of the wave model: gradually increasing distance between dialects in a continuum eventually leads to sharp language boundaries. However, an important

difference – besides the fact that tree-like splits, or fissures, are also included in Ross' model – is that the emergence and eventual differentiation of dialect continua, or linkages, are recursive, i.e., these processes may happen more than once in the history of a language family. As Ringe & Eska (2013: 262) point out, linkage breakings may be caused by the disappearance of intermediate dialects. Such dialect pruning may occur when neighbouring dialects are “pulled” apart toward different centres of innovation, as in Schmidt's (1872) wave model, or simply because the speakers of intermediate dialects undergo a language shift or die out.

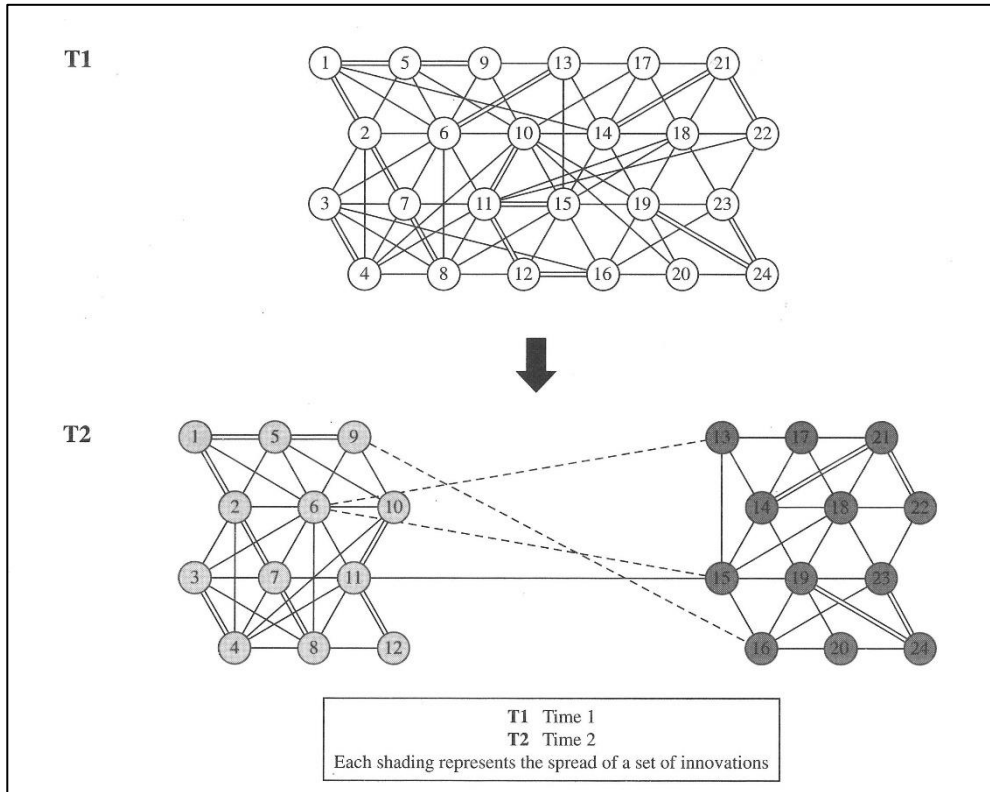


Figure 9. Language fissure according to Ross (1997).

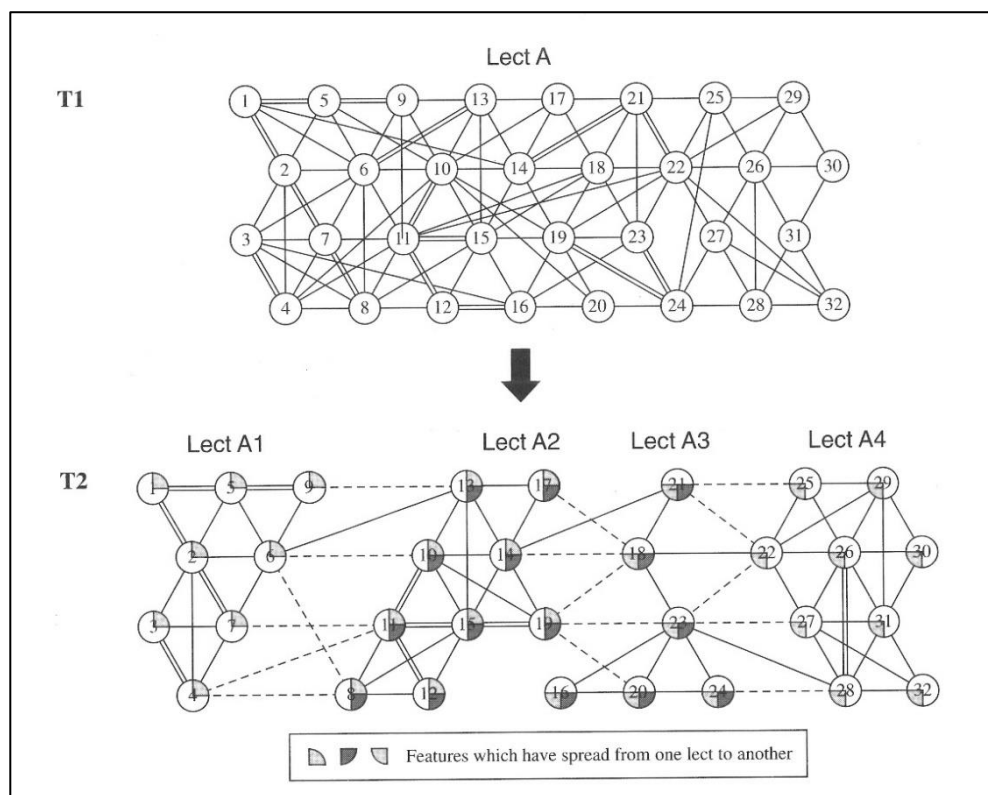


Figure 10. Lectal differentiation according to Ross (1997).

Ross (1997: 228) furthermore includes “language fusion” and “linkage rejoining” in his model, which refer to shared innovations affecting languages or dialects that have already undergone exclusive innovations. Such processes presuppose that some level of mutual intelligibility remains between the dialects in question, although this is notoriously difficult to measure, especially for reconstructed protolanguages. This resembles Gamkrelidze & Ivanov’s (1995: 364) treatment of the satem branches, and suffers from the same theoretical problem: lack of falsifiability. However, Ross’s example from Anejoñ (Austronesian) is instructive. Anejoñ shows two reflexes of the Proto-Oceanic article **na*, which seem to be lexically distributed without phonological or other conditioning. This situation may be explained by assuming that Anejoñ is a fusion of two separate dialects.³²

Yet, the Anejoñ example is not comparable to satemization, since here the satem branches show internally consistent, but slightly variable, reflexes of the Proto-Indo-European velar series (cf. 1.3). It has been argued that the limited velar reflexes of Proto-Indo-European palatovelars in Balto-Slavic point to borrowings from a centum-dialect, which would also be compatible with Balto-Slavic originating in a fusion of two Indo-

³² It may be argued that the conditioning factor simply has not been found yet, but assuming that the analysis is correct, the postulation of a fusion event is a possible explanation.

European dialects (Čekman 1974: 133), but these alleged centum forms are rather conditionally depalatalized palatovelars (cf. Kortlandt 1978b) that do not justify such a scenario. In any case, language fusion and linkage rejoining are processes that must be taken into account in subgrouping research, but perilous to incorporate into models of Indo-European diversification. Given the language family's time depth, it is difficult to estimate at which point the would-be branches of Indo-European were different enough that shared innovation would no longer be possible. Accordingly, language fusion or linkage rejoining should only be assumed when tree-like splits and linkage breakings fail to explain the data, i.e., as a tertiary hypothesis.

2.5. Linguistic palaeontology

Linguistic palaeontology (a term coined by Pictet 1859–1863) is an extension of the comparative method. While protolanguages may be reconstructed based on the comparative method, the basic idea of linguistic palaeontology is to infer aspects of the culture of the speakers of a certain protolanguage based on the contents of the reconstructed lexicon. Consequently, the focus lies on the semantics of reconstructed words. In most cases, the goal is to compare the culture of the protolanguage community to archaeological cultures, in order to formulate hypotheses on the timeframe and location of the protolanguage and its speakers, known as the *homeland* (Ger. *Urheimat*).

The first systematic application of linguistic palaeontology can probably be attributed to Kuhn (1845). Kuhn compiled reconstructed Proto-Indo-European words pertaining to the structure of the family (kinship terms), government, domesticated as well as wild animals, agriculture, and housing. Based on this, he argued that Proto-Indo-European speakers organized their society on the model of the family, which was patriarchal and patrilocal. Furthermore, Kuhn concluded that the Indo-Europeans practiced both animal husbandry and agriculture, and that they had transitioned from a nomadic to a sedentary lifestyle. However, he does not use these results to infer an Indo-European homeland; rather, Kuhn (1845: 1–2) asserts in his introduction that Proto-Indo-European was spoken in Asia. In a revised version, Kuhn (1850: 338) specifically rejects a steppe homeland, and instead places it on the Tibetan plateau.³³ Similarly, Pictet (1859–1863), who applied linguistic palaeontology to the Proto-Indo-European lexicon in great detail, nevertheless takes a Bactrian homeland as a given, and interprets the lexicon against this assumption.³⁴

Schrader (1883) reversed this workflow, and (in the second, revised edition of his *magnum opus*, published in 1890) located the Indo-European homeland in the Pontic-Caspian steppe based on linguistic palaeontological considerations, thus formulating the Steppe hypothesis. The most important arguments were the existence of Proto-Indo-

³³ “[U]nsre gemeinsamen Vorfahren weideten ihre Heerden nicht in den kahlen Steppen, sondern auf den bewaldeten Bergen Hochasiens [Tibetan plateau, AP]...” (Kuhn 1850: 338).

³⁴ For example, Pictet (1859–1863: I, p. 382–86) argues that the Indo-Europeans must have known the camel, despite the fact that no Proto-Indo-European word for ‘camel’ can be reconstructed, since the two-humped camel originates in Bactria, which according to Pictet is the location of the homeland.

European nomadic pastoralist vocabulary (i.e., domesticated animals and wagon terminology) vs. the absence of shared Indo-European agricultural terminology, as well as the presence of a word for ‘horse’ vs. the absence of words for ‘camel’ and ‘donkey’.³⁵ These arguments have stood the test of time and still feature in studies on the Indo-European homeland (e.g., Mallory 1989; Anthony 2007; Anthony & Ringe 2015). Apart from arguments bearing on technologies and subsistence strategies, recent scholarship has also revisited the relationship between kinship terms as evidence for social organization (cf. Kuhn 1845) and archaeological and genetic evidence for patrilocal families in Chalcolithic Europe (Sjögren et al. 2020), which show a striking correspondence.

Schrader (1883) discusses three important methodological principles of linguistic palaeontology. The first principle (Schrader 1883: 168ff) is that conclusions should in the first instance be based on positive rather than negative evidence; in other words, *absence of evidence is not evidence of absence*. The failure to reconstruct a shared Indo-European word for a particular concept does not imply that Proto-Indo-European speakers were unfamiliar with that concept. If, however, a whole semantic field is absent from the protolanguage, and contrasts with abundant positive evidence for another, such as the lack of terms for relatives on the wife’s side of the family vs. the rich terminology for relatives on the husband’s side, Schrader argues that this may be significant and therefore tentatively may be used as evidence of absence. Mallory (2021: 281) argues that arguments based on absence should not be rejected by default, since they at least potentially may correlate to real-world situations, and are often used in other historical disciplines, such as archaeology.

Another principle, which follows from the comparative method, is that only words that are actually reconstructable to a particular linguistic layer, e.g., Proto-Indo-European, may be used as evidence for reconstructing the culture of that speech community (Schrader 1883: 175ff). For example, words that are only found in one or a few branches should not be back-projected to the protolanguage without good arguments. This ties into the general discussion of which criteria an etymon needs to fulfil to be reconstructed to Proto-Indo-European (cf. 2.2.5 above). Similarly, root cognates with different derivatives in various branches do not license the reconstruction of the derived concepts to the protolanguage, if the root in question is still productive in the branches (Schrader 1883: 188ff). Great care must be taken to understand the derivational history of words within the branches, to exclude independent innovations from consideration. A related issue is loanwords between branches, which must be filtered out to avoid projecting them back to the protolanguage (Schrader 1883: 201ff).³⁶ However, Schrader argues that it may in some cases be impossible to differentiate between an inherited formation and an early borrowing between Indo-European dialects that had not yet diverged phonologically to the extent that a borrowing could be identified (similarly Hehn 1877: 487–88).

³⁵ As Schrader (1890) acknowledges in his preface, Benfey (1875) had already proposed a Pontic-Caspian steppe homeland, but merely as a comment on Hehn’s (1873: 16–17) Asian homeland, which according to Benfey did not explain the existence of a Proto-Indo-European word for ‘salt’. Tomaschek (1878: 862; 1883: 706) supported Benfey’s hypothesis based on the language contact between early Indo-European and Uralic languages.

³⁶ On the other hand, the identification of early borrowings may point to the adoption of a foreign or novel concept, whereas language internal derivation (e.g., PIE **k^wek^wlo-* ‘wheel’) may suggest a “native” technological development.

A third principle (Schrader 1883: 194ff) is that attested semantics should not be back-projected to reconstructed forms without good arguments. For example, the reconstructed **h₁ek_uo-* ‘horse’ did not necessarily refer to a domesticated horse (Hehn 1877: 53–54; Renfrew 1989), and so does not by itself prove that Proto-Indo-Europeans kept and/or rode domesticated horses. In general, great care must be taken on a case-by-case basis not to overinterpret the semantic meaning of reconstructed lexemes.

The validity of linguistic palaeontology as a scientific methodology has been called into question (Pulgram 1958: 145; Anttila 1972: 373; Renfrew 1987: 77f; Zimmer 1990: 7; Clackson 2013). Heggarty, one of the most vocal critics of linguistic palaeontology, argues that the chance of parallel derivation and the uncertainty of semantic reconstruction makes it impossible to use reconstructed lexemes as evidence for extra-linguistic situations (Heggarty 2006: 189). While he accepts reconstruction of forms as reliable in principle, Heggarty (2006: 190; 2013: 162; 2014: 607–8; Heggarty et al. 2023: S20–21) argues that semantic reconstruction to the level of detail required by linguistic palaeontology is not possible (cf. Krell 1998: 279), since semantic change is not governed by laws in the same way as sound change. For example, Heggarty claims that there is no way to determine with any degree of certainty that PIE **k^wek^wlo-* referred to the wheel of a wagon rather than some other circular object, with independent semantic shifts to ‘wheel’ in Indo-Iranian, Greek, Germanic, and Tocharian.

However, as we have seen above, the fact that both formal and semantic reconstruction suffers from a certain level of uncertainty has long been recognized by proponents of linguistic palaeontology; in any historical discipline, interpretations of the data are ultimately statements of likelihood. As Mallory (2021: 280) puts it, a reconstructed semantic meaning is an “inference to the best explanation [...] for the current senses of a set of cognates”. In the case of PIE **k^wek^wlo-*, other than the fact that its descendants refer to the ‘wheel (of a vehicle)’,³⁷ meaning that assuming independent semantic shifts is uneconomical, we may point to the typological tendency of the directionality *concrete* > *abstract*, which makes it less likely that Gr. κύκλος ‘circle, ring, wheel’ preserves an original meaning ‘circle’, to which ‘wheel’ is secondary. Furthermore, PIE **k^wek^wlo-* seems to be derived from **k^wel(H)-* ‘to move around, roam’, suggesting that its original meaning was associated with transportation rather than simply rotation or a round shape. Coleman’s (1988: 450) assertion, cited by Heggarty (2014: 608), that **k^wek^wlo-* cannot be reconstructed for Proto-Indo-European because it is only attested in four branches, fails to take into account that the reduplicated stem of **k^wek^wlo-* is not a productive derivational type in any of the relevant branches (or indeed any branch of Indo-European). Heggarty’s criticism is of course not limited to **k^wek^wlo-*, but concerns the methodology as a whole. However, this one example shows that he dismisses linguistic palaeontology without taking all the relevant facts into account.

Heggarty (2013: 163–64; 2018: 169) further criticizes linguistic palaeontology as being subjective, because it has been used as evidence for conflicting homeland hypotheses (cf. Bryant 2001: 123). However, as Mallory (2021: 279) points out, the existence of

³⁷ Or, in the case of ToA *kukäl*, ToB *kokale* ‘chariot, wagon’, to the wheeled vehicle itself.

competing hypotheses is the normal situation for all scientific frameworks. Heggarty does not take into account that other variables might be responsible for the varying results achieved by different scholars, such as different data sets, failure to correctly apply the comparative method and the methodological principles of linguistic palaeontology, or reliance on incorrect archaeological models.³⁸

Thus, in the present work, linguistic palaeontology will be used following the methodological principles outlined above. The emphasis will lie on positive evidence and semantic fields that plausibly may be correlated to archaeological evidence.

³⁸ Heggarty (2018: 169) specifically mentions Gamkrelidze & Ivanov's (1995) Armenian hypothesis as opposed to the Steppe hypothesis. However, Gamkrelidze & Ivanov's (1995: 763–767) conclusions are based on a dataset that includes many lexemes that are highly unlikely to be Proto-Indo-European, e.g., **osono-* 'donkey' (based on the irregular correspondence of Gr. ὄνος 'donkey' and Lat. *asinus* 'donkey', cf. de Vaan 2008: 57), as well as controversial archaeological hypotheses, such as the Near Eastern origin of wheel/wagon technology (Schier 2015: 113).

3. Lexical isoglosses shared by Indo-Iranian and Balto-Slavic

3.1. Introduction

In this chapter, potential lexical isoglosses shared by Indo-Iranian and Balto-Slavic proposed by Schmidt (1872), Meillet (1926), Arntz (1933), and Porzig (1954) are compiled and evaluated etymologically. Additionally, Derksen's Baltic (2015) and Slavic (2008) etymological dictionaries, as well as Fraenkel's LEW (1962), have been mined for potential exclusive isoglosses with Indo-Iranian.

All potential isoglosses are evaluated based on three criteria (summarized in Table 1): 1) Indo-Slavic exclusivity, 2) validity of the etymology, 3) likelihood of being a shared innovation.

The first criterion is fulfilled if the etymon in question is not found in any Indo-European branch other than Indo-Iranian and Balto-Slavic. If there is a potential cognate in another branch, which cannot be explained away, but for formal or semantic reasons is not a compelling cognate to the Indo-Iranian-Balto-Slavic words, the Indo-Slavic exclusivity is classified as uncertain. If the isogloss is shared with another branch, or must be reconstructed for another branch as the basis for an attested derivative, the isogloss is non-exclusive and is rejected.

The second criterion is fulfilled if the words forming the lexical isogloss are formally and semantically compelling cognates, i.e., if they are plausibly inherited from a common source. If there are indications that this is not the case, the isogloss is classified as doubtful or rejected.

The third and arguably most important criterion is whether the isogloss in question is a plausible shared innovation. As discussed in Chapter 2, in most cases it is difficult to determine with a high level of confidence whether isoglosses are shared innovations, archaisms, or independent innovations, either because other branches may have lost them (lack of *identifiability*) or because the *ancestral state* cannot be determined (or a combination of both). The result is that most isoglosses are classified as possible shared innovations. However, if an Indo-Slavic isogloss can be shown to reflect an innovative state

vis-à-vis an ancestral state attested in other branches, it is classified as a plausible shared innovation. If there are compelling reasons to assume that an isogloss is an archaism or independent innovation, it is classified as a rejected shared innovation.

To allow the reader to get a quick overview of a given potential isogloss, the three criteria are treated independently as much as possible, even though they are often interdependent. For example, the etymology of **b^hag-o-* ‘god’ (cf. 3.5.1) is classified as *rejected*, since the Indo-Iranian and Slavic forms are not regular cognates. However, since there are no compelling arguments against a shared innovation per se, the shared innovation criterion is classified as *possible*. In reality, of course, the etymology criterion must be fulfilled for an isogloss to be considered compelling. Inevitably, the criteria sometimes intersect, since, e.g., indications that a proposed isogloss reflects independent innovations in the branches may lead to the etymology being classified as doubtful or rejected.

The potential lexical isoglosses are further classified according to type. The typological categories are:

- 1) borrowing (shared borrowings from known or unknown source)
- 2) nominal derivation (shared nominal derivatives from inherited roots)
- 3) verbal derivation (shared verbal derivatives from inherited roots)
- 4) root (shared root without shared derivatives)
- 5) semantics (shared semantics in a root or derivative)

The material is grouped into four sections. Etyma that fulfil the exclusivity and etymology criteria are classified as compelling isoglosses. These are subdivided into plausible and possible shared innovations (sections 3.2–3.3). Etyma for which the exclusivity is uncertain, or the etymology is doubtful, are classified as uncertain isoglosses (3.4). Etyma for which either the exclusivity, etymology, or shared innovation criterion is rejected, are classified as rejected isoglosses (3.5).

Within each section, the isoglosses are listed in alphabetical order according to their reconstructed form. Below the classification header for each potential isogloss, the Indo-Aryan, Iranian, Baltic, and Slavic cognates are listed. For Indo-Aryan, mainly Vedic Sanskrit is listed. For Iranian, cognates in the following languages are listed in sections 3.2–3.4: Avestan and Old Persian, Middle Persian (or Parthian), Modern Persian (or Balochi), Sogdian and Khotanese (or Khwarezian and/or Bactrian), Ossetic, Pashto, and Wakhi, when available, with occasional references to other Modern Iranian languages. In section 3.5, mainly Old Iranian cognates are listed. In the case of Baltic, Lithuanian and Latvian cognates are listed, followed by Old Prussian, when available. Lastly, Slavic cognates from Old Church Slavic, followed by a representative of each branch (East = Russian, West = Polish, South = Serbo-Croatian, or other languages from that branch when necessary) are listed.

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes/ Uncertain/ No	Compelling/ Doubtful/ Rejected	Plausible/ Possible/ Rejected	Borrowing/ ^N Derivation/ ^V Derivation/Root/Semantics

Table 1. Criteria for classification of Indo-Slavic lexical isoglosses.

3.2. Isoglosses: plausible shared innovations

3.2.1. **ǵʰos-to-* ‘hand’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Plausible	^N Derivation

Indo-Aryan: Skt. *hásta-* m. ‘hand’

Iranian: OAv., YAv. *zasta-* m. ‘hand’; OP *dasta-* m. ‘hand’; MiP Pahl. *dast*, Man. *dst* ‘hand’; MoP *dast* ‘hand’; Sogd. BMS *ōst* ‘hand, arm’; Khot. *dasta-* ‘hand’; Psht. *lās* m. ‘hand’; Wakh. *dast*, *ḍast* ‘hand’

Baltic: Lith. *žāstas* m. ‘upper arm; palm of the hand (Žem.)’, *pažastis* f. ‘arm-pit’

Slavic: –

As noted by Arntz (1933: 37) and Porzig (1954: 169),³⁹ Lithuanian and Indo-Iranian share a stem **ǵʰos-to-* ‘hand’ (rather than **ǵʰes-to-* in view of Baltic *a* < **o*, cf. Neri 2013). This stands in opposition to **ǵʰes-r-*, reflected by Hitt. *keššar* c. ‘hand’ (Kloekhorst 2008: 471), Gr. *χεῖρ* f. ‘hand, fist’ (Beekes 2010: 1620–21), Arm. *jeṛn* ‘hand’ (Martirosyan 2010: 431–32), Alb. *dorë* f. ‘hand, handful, grip’ (Demiraj 1997: 140), ToA *tsar*, ToB *šar* m. ‘hand’ (Adams 2013: 711–12), and perhaps Lat. *hīr*, *īr* n. ‘palm of the hand’ (Walde 1910: 366). The athematic stem of **ǵʰes-r-*, and its attestation in Anatolian, suggests that it is a more archaic formation than **ǵʰos-to-*.

The Indo-Iranian reflexes of **ǵʰos-to-* clearly mean ‘hand’.⁴⁰ Lith. *žāstas* m. is attested both with the meaning ‘palm of the hand’ and ‘upper arm’, the latter being presupposed by the derivative *pažastis* f. ‘arm-pit’. It is possible that a semantic shift in most Lithuanian dialects occurred when *rankà* replaced *žāstas* as the basic word for ‘hand’.

Lat. *praestō* ‘available, ready’ has been reconstructed as **prehzi-ǵʰestōd* (e.g., LEW: 560) but has a more convincing alternative analysis as **prehzi-sth₂-o-* (de Vaan 2008: 486). Lat. *hostus* m. ‘the yield of olive oil from a single pressing’, which Eichner (2002) has derived from **ǵʰos-to-* (**ǵʰ-* is also possible), a deverbal nomen actionis from a supposed root **ǵʰes-* ‘to take, give in exchange’, must be separated from **ǵʰos-to-* ‘hand’ based on the semantics. Even if the words are ultimately from the same root, the Latin stem is better analysed as an independent derivative, cf. Gr. *χόρτος* m. ‘enclosure, court’ < **ǵʰor-to-* << **ǵʰer-* ‘to seize’.

Neri (2013) derives both **ǵʰes-r-* and **ǵʰos-to-* from old locatives of an unattested root noun **ǵʰes-* ‘hand’ << ‘the one who gives or takes’. The latter stem would then have arisen through the derivational chain **ǵʰos-to-* ‘upper arm’ << **ǵʰes-tó-* ‘belonging to the hand; situated in the hand’ << **ǵʰés-* loc.sg. ‘in the hand’. This scenario is difficult to verify, since it hinges on the idea that **ǵʰos-to-* meant ‘upper arm’ originally, which as

³⁹ However, only Lith. *pažastis* is mentioned. Lith. *žāstas* ‘upper arm; palm of the hand (Žem.)’ has been left out of most sources, but see Hock et al. (2019: s.v. *pažastis*).

⁴⁰ Skt. *hásta-* sometimes refers to the wrist, e.g., *háste nā khādīnam* ‘like a bangle on the hand’ (RV VI.16.40), *pári eti bāhūm ... hastaghñá-* ‘it encircles the arm ... the handguard’ (RV VI.75.14), and later to the forearm as a measurement (‘ell’), but not to the ‘upper arm’ (pace EWAia II: 812).

discussed above is not necessarily the case, and since an endingless locative **ǵʰés-* cannot be distinguished from the bare root. In any case, Neri's proposal is not incompatible with taking **ǵʰos-to-* as an Indo-Slavic innovation, provided that Lat. *hostus* m. 'yield' is explained as an independent derivative.⁴¹

Superficially, **ǵʰos-to-* looks like a root **ǵʰos-* + suffix **-to-*, but the meaning 'hand' (<< 'taker'?) does not fit very well with the expected semantics of a *to*-stem from a root **ǵʰes-* 'to take, exchange', as suggested by, e.g., Lat. *hostus* m. 'yield' and Gr. *χόρτος* m. 'enclosure, court'. However, the sequence **-st-* is reminiscent of several other Indo-European words for 'hand' or related concepts, e.g., Gr. *παραστή* f. 'flat hand, breadth of four fingers', *ἄγοςτός* m. 'hand, arm', OHG *fīst* f. 'fist', OCS *grǣstb* f. 'handful', Skt. *gābhastī-* m. 'hand', *muṣṭī-* m./f. 'fist'. Although the origin of this **-st-* is unknown, it is possible that **ǵʰos-to-* should be analysed as **ǵʰos-st-o-*, which could be an old compound. In either scenario, since the presumed verbal base for a *to*-stem or a compound, i.e., **ǵʰes-* 'to take, exchange', is unattested, the derivation of **ǵʰos-to-* within a hypothetical Indo-Slavic subgroup rests on the assumption that **ǵʰes-* existed in Indo-Slavic and was lost as a productive root at a later date, which is impossible to verify.

While the exact derivation of **ǵʰos-to-* remains elusive, the absence of any reflex of PIE **ǵʰes-r-* in Indo-Iranian and Balto-Slavic suggests that it was replaced by **ǵʰos-to-* in Indo-Slavic, which was subsequently replaced by **ronkaH-* in Balto-Slavic. Accordingly, it is not necessarily the derivation of **ǵʰos-to-* itself that is a plausible shared innovation (although this remains possible), but the replacement of **ǵʰes-r-* as the basic word for 'hand' (in the sense of Tadmor, Haspelmath & Taylor 2010) by **ǵʰos-to-*.

3.2.2. **h₂eǵ-* 'goat'

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Plausible	Borrowing Root

Indo-Aryan: Skt. *ajā-* m. 'billy goat', *ajā-* f. 'she-goat'

Iranian: YAv. *aza-* m. 'billy goat'; MiP Pahl. *azag* 'goat';⁴² Khot. *aysdām* 'a commodity; goat's corn (?)'⁴³

Baltic: Lith. *ožys* m. 'billy goat'; Latv. *āzis* m. 'billy goat'; OPr. *wosux* m. 'billy goat', *wosee* f. 'goat, she-goat' (EV)

Slavic: –

⁴¹ Besides Lat. *praestō* 'available, ready', which does not necessarily contain **ǵʰos-to-* (cf. above), Neri (2013) proposes that Lat. *hostis* m. 'enemy; stranger' ~ ON *gestr* m. 'guest' < **ǵʰos-ti-* 'the one who is in the hand (i.e., under protection)' provide independent evidence for an adjective **ǵʰes-tó-* 'belonging to the hand'. However, Slavic **gōstb* m. 'guest', which is otherwise a perfect cognate to the Latin and Germanic words, must then be explained as a borrowing from Germanic, since it cannot reflect **ǵʰ-*.

⁴² The attestation in Frahang-i Pahlavik is uncertain; it may stand for Aramaic 'ez 'goat' (Nyberg & Utas 1988: 70–71).

⁴³ If from **Haja-dʰaHnaH-* (Bailey 1979: 6).

Based on the Indo-Iranian (EWAia I: 51; Hoffmann 1967) and Baltic (LEW: 519) forms, **h₂eǵ-* ‘goat’ may be reconstructed, which was listed as an isogloss by Arntz (1933: 37).

The root **h₂eǵ-* closely resembles the synonymous **h₂eiǵ-* ‘goat’, which is reflected in Gr. αῖς f. ‘goat’ (Beekes 2010: 40–41), Arm. *ayc* ‘she-goat, goat’ (Martirosyan 2010: 58) and Alb. *edh* m. ‘kid, young goat’ (Orel 1998: 85; de Vaan 2018: 1739). LEW: 519 also cites Irish *ag* ‘buck’ as a cognate of Lith. *ožỹs*, but in eDIL (s.v. *ag*) it is translated as ‘cow, ox’ or ‘deer, stag’. According to Pokorny (IEW: 7), it is rather related to Skt. *ahí-* f. ‘cow’.

Albanian *dhi* ‘goat’ has variously been connected to **h₂eǵ-*, **h₂eǵ-* or Ger. *Ziege* < **dig^h-eh₂-* (IEW: 6–7; Demiraj 1997: 160; Orel 1998: 83; Kroonen 2013: 516). Even if **dig^h-eh₂-* is excluded, it seems uneconomical to derive *dhi* from **h₂eǵ-ih₂-*, separating it from Alb. *edh*, instead of **h₂eiǵ-ih₂-* (both being possible since initial unstressed vowels are lost, cf. de Vaan 2018: 1737), thereby reconstructing two words for ‘goat’ for Proto-Albanian.⁴⁴ We should therefore treat **h₂eǵ-* as an Indo-Slavic isogloss.

A zero-grade of **h₂eiǵ-* is reflected in YAv. *izaēna-* ‘of leather’, which presupposes a base Plr. **ija-* ‘leather’.⁴⁵ It has been argued that Skt. *eḍa-* m. ‘a type of sheep’ also reflects **h₂eiǵ-* and developed through levelling of the stem of the dat.pl. **aij-b^hias* > **eḍbhyas*. However, not only is the meaning different, but it is unlikely that this sandhi development would not have been reverted upon thematicization.

While a thematic **Haj-a-* next to a feminine **Haj-aH-* can safely be reconstructed for Proto-Indo-Iranian, East Baltic shows a masculine *io*-stem (Lith. *ožỹs*) next to a secondary feminine reflected by Lith. *ožkà*. In Old Prussian, it is rather the masculine (*wosux* ‘billy goat’) that is secondary, being reflected by a diminutive. It seems attractive to assume that Baltic replaced an original *o*-stem by **āž-io-* based on the feminine **āž-iā-* (reflected by OPr. *wosee*), which would have been the unmarked form, cf. Gr. αῖς f. ‘goat’.⁴⁶ However, strictly speaking **h₂eǵ-* is merely a root isogloss.

Kroonen (2012: 245–46) argues that **h₂eǵ-* and **h₂eiǵ-* should be seen as loanwords originating in non-IE languages. This challenges the view that **h₂eǵ-* ‘goat’ is derived from **h₂eǵ-* ‘to drive’. The substrate scenario is attractive, as it offers an explanation to the close formal and semantic similarity of these words, whereas the etymological connection to **h₂eǵ-* ‘to drive’ is unclear from a derivational point of view⁴⁷ and attributes the closeness to **h₂eiǵ-* to chance.

However, the existence of YAv. *izaēna-* ‘of leather’ etc. has important implications for the substrate scenario. It presupposes the existence of **h₂eiǵ-* in a prestage of (Indo-)Iranian from which **ija-* < **h₂iǵ-o-* could be derived through a native derivational

⁴⁴ The vocalism of Alb. *edh* cannot be explained by umlaut, since **h₂eǵ-io-* should have yielded Alb. ***ez*, cf. *vis* m. ‘place, land, country’ < **uik-io-* (Demiraj 1997: 65). A preform **h₂eǵ-i-* may be possible but is *ad hoc*.

⁴⁵ Plr. **ija-* seems to be directly attested in Khot. *hāysā-* ‘skin, hide’. Cf. also Yi. *ize*, Mu. *yijya* ‘goatskin used for carrying sour milk’, Psht. *žay* m. ‘leather bag, mussuck’ (Morgenstierne 1938: 195; 2003; Bailey 1979: 484).

⁴⁶ A masculine *io*-stem may be reflected in Old Prussian place names, e.g., *Wosi-birgo* ‘Ciginburg’, i.e., ‘Goat’s Town’ (Smoczyński 2018: 886).

⁴⁷ Why would **h₂eǵ-o-* be ‘the one being driven (by a goatherd)’ rather than ‘the driving one’, cf. Skt. *ajā-* m. ‘driver’?

process.⁴⁸ This prestige may be Core Proto-Indo-European, based on the attestation of **h₂eiǵ-* in Greek, Armenian, and Albanian. The fact that the Indo-Iranian word for goat contains **h₂eǵ-* suggests that this root replaced **h₂eiǵ-* in Indo-Iranian after the break-up of Core Proto-Indo-European. This replacement may be taken as a shared innovation with Balto-Slavic. The opposite scenario, i.e., that **h₂eiǵ-* replaced an older root **h₂eǵ-* ‘goat’, whether borrowed or derived from **h₂eǵ-* ‘to drive’, is precluded by PIr. **ija-* ‘leather’, as we would then expect the word for goat in Indo-Iranian (and Balto-Slavic) to be derived from **h₂eiǵ-*.

The root **h₂eǵ-* ‘goat’ may thus be regarded as a root isogloss of Balto-Slavic and Indo-Iranian as well as a possible shared borrowing from an unknown source. Due to the shared derivative from this root, **h₂eǵ-ino-* ‘animal skin, leather’ (see 3.2.3 below), **h₂eǵ-* can hardly have been borrowed independently by the branches.

3.2.3. **h₂eǵ-ino-* ‘animal skin, leather’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Plausible	^N Derivation Semantics

Indo-Aryan: Skt. *ajína-* n. ‘(animal) skin’

Iranian: YAv. *azina-uuaŋt-* ‘who wears a hide’; Wakh. *yazn* ‘inflated skin, mussuck’

Baltic: (Lith. *ožinis* ‘goat-’)

Slavic: RuCS *jazbno* n. ‘skin, leather’; SerbCS *jazbno*, *azbno* n. ‘skin, leather’

A derivative in **-ino-* from **h₂eǵ-* may be reconstructed based on the Indo-Iranian (EWAia I: 51–52; Hoffmann 1967) and Slavic (Derksen 2008: 31–32; Vasmer III: 485) forms. This was listed as an isogloss by Arntz (1933: 37). The Lith. adjective *ožinis* ‘goat-’ is better analysed as an independent innovation given its semantics and the productivity of *-inis*.

Alb. *dhirë*, *-në* ‘pertaining to goat’ is compared by Demiraj (1997: 160), but given the productive semantics it is likely an independent formation based on Alb. *dhi* ‘goat’, which more likely belongs with Gr. *αἴξ* ‘goat’ < **h₂eiǵ-* rather than **h₂eǵ-* (see p. 42).

The Proto-Indo-Iranian reconstruction of **Haj-ina-* is assured by Wakh. *yazn* ‘inflated skin, mussuck’ (not < **iz(a)na-*, pace Steblin-Kamenskij 1999: 424).⁴⁹ PIr. **Haj-ina-* ‘animal skin’ existed next to **ija-* ‘leather’, which was retained in Iranian (see p. 42). According to Brugmann (1892: 146), **-ino-* was not productive in Indo-Iranian. AiGr. II, 2: 350–51 lists some innovative Skt. stems in *-ina-* but these mean ‘having X’ like *śākiná-* ‘mit Kraut bewachsen’ not ‘pertaining to X’ like *ajína-* presupposes. Some seem to

⁴⁸ The derivational process behind **h₂aiǵ-o-*, if from **h₂eiǵ-*, is unclear to me. A possessive thematic derivative seems unlikely, as this should mean ‘having goat’.

⁴⁹ Wakhi underwent a stress shift from a short penultimate to the antepenultimate (Morgenstierne 1938: 483–84), thus *yazn* < **Hajína-* < **Hajína-*. A preform closer to YAv. *izaēna-* ‘of leather’ would not have produced the attested form. Similarly, Wakh. *yijín* ‘carpet’, which has been connected to YAv. *izaēna-* etc. (Bailey 1979: 484), is better explained as a derivative of *yazn* < **Haj-ina-* with weakening of unstressed initial **a-* (cf. Morgenstierne 1938: 478).

be derivatives in *-a-* from *in*-stems, while others are *no*-derivatives from *i*-stems. It is therefore unlikely that **Haj-ina-* was derived within Indo-Iranian.

In Balto-Slavic, **-ino-* is commonly used for adjectives of material, origin, and type (Brugmann 1892: 147), which is similar to its usage in Greek. However, within Slavic **azbno* is not comparable to productive formations like OCS *želěznъ* ‘of iron’ ~ *želězo* ‘iron’.⁵⁰ Rather, it is a substantivized neuter adjective which was lexicalized with the meaning ‘skin, leather’, exactly parallel to PIIr. **Haj-ina-* ‘animal skin’. Notably, **h₂eǵ-ino-* has lost its connotation to ‘goat’ in both branches, which constitutes a semantic innovation.

The fact that Slavic **azbno* is a neuter suggests that it was originally oxytone, since Indo-European barytone neuters became masculine due to the merger of unaccented nom.-acc.sg.n. **-om* > *-ъ* with nom.-acc.sg.m. *-ъ* (Illich-Svitych 1979: 115). As this does not match Skt. *ajína-*, we may assume that Slavic underwent an accent shift by analogy to other stems in **-bno*, e.g., OCS *brъvnъno* n., Ru. *brevnó* n., SCr. *brъvno* ‘beam, log’ < PSll. **brъvnъnò* (cf. ESSJ III: 72), or that Indo-Iranian underwent an accent shift by analogy to the denominal suffix *-ín-*, cf. *mahín-*, *mahína-* ‘great, mighty’.

Despite the difference in accentuation, the fact that Slavic and Indo-Iranian otherwise share both the derivational morphology and the semantics of **h₂eǵ-ino-* makes it a compelling isogloss. Neither branch is likely to have innovated **h₂eǵ-ino-* independently, but, on the other hand, an archaism is also unlikely, as the base **h₂eǵ-* ‘goat’ seems to have replaced an older **h₂eǵ-* in Indo-Iranian and Balto-Slavic (see p. 42). This makes **h₂eǵ-ino-* a plausible shared innovation.

3.2.4. **neih₁-* ‘to churn’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Plausible	Root Semantics

Indo-Aryan: Skt. *nīta-* ‘churned; butter’ (ĀpŚS), *nāvanīta-* ‘fresh butter’ (KS+), *netra-* ‘cord with which the churning stick is set in motion’ (Br.+)

Iranian: Bal. *nēmaǵ* ‘butter’; Kajali *niru* ‘to churn’; Khot. *nīyaka-* ‘fresh butter’, *ñ(y)e* ‘buttermilk’; Shu. *nay-*, *nid-* ‘to churn’; Wakh. *pərnəc* ‘to churn’; Yi. *nīya*, Mu. *nīyo* ‘sour milk’

Baltic: Latv. *nīt*, *niju* ‘to churn, thread (a needle)’, *pa-nijas*, *pa-nīnas* f.pl. ‘buttermilk’, *sviēstnīņas* f.pl. ‘the brine which gathers under butter’

Slavic: –

Although formally identical to Skt. *nayⁱ-* ‘to lead’, a separate root **neiH-* ‘to churn’ has traditionally been reconstructed for semantic reasons (EWAia II: 25–26; Cheung 2007: 279). For the Baltic forms, see LEW: 505 and Derksen (2015: 545). However, Kloekhorst & Lubotsky (2014) have convincingly argued that Skt. *nayⁱ-* ‘to lead’ ~ Hitt. *nai⁻ⁱ*, *nē^{-a(ri)}*

⁵⁰ A seemingly parallel formation is OCS *platъno* n. ‘linen’, but in this case the derivational base is unclear.

‘to turn, send’ (< **neiH-*, cf. LIV: 450), on the one hand, and Lat. *neō* ‘to spin’ ~ Gr. *véō* ‘to spin’ ~ OHG *nāen* ‘to sew’ (< **(s)neh₁-*, cf. LIV: 571–72), on the other, belong under a single PIE root **(s)neh₁(i)-* ‘to turn, twist’, from which **neiH-* ‘to churn’ may also be derived (cf. the turning of the churning stick). The meaning ‘to churn’ is restricted to Latvian and Indo-Iranian. Baltic and Slavic also reflect a noun **nih₁-ti-* ‘thread’ (e.g., Lith. *nýtis* f. ‘(warp) thread’, SCr. *nīt* f. ‘thread’, cf. Derksen 2008: 353–54). Skt. *nīvī-* f. ‘piece of cloth wrapped around the waist, worn by women’ (AV+) could show a similar connotation to textile production, but could also simply refer to a ‘twisted’ piece of cloth.

According to Kloekhorst & Lubotsky (2014), the **i* of **(s)neh₁(i)-* is originally a verbal suffix. This situation is clearly discerned in Hittite, where the present active *nai⁻ⁱ* ‘to turn, send’ and the reduplicated *nanna⁻ⁱ* ‘to drive’ are best reconstructed as **nh₁-oi-* and **ne-nh₁-oi-*, respectively, whereas the middle *nē^{-a(ri)}* may reflect a root stem **neh₁-*.⁵¹ The *i*-suffix is ubiquitous in Indo-Iranian and Balto-Slavic verbal descendants of the root.⁵² Latin *neō* ‘to spin’ and OIr. *sníid* ‘to twist’ could derive from a thematicized *i*-present **(s)neh₁-ie/o-*, but the *ie/o*-stem may also be secondary (cf. de Vaan 2008: 405). Similarly, Gr. *véō* ‘to spin’, with the 3sg.imf. *évvn̄*, points to **(s)neh₁-*, but 3sg.pres. *vḗi* ‘spins’ < **(s)neh₁-ie/o-* could reflect a thematicized *i*-present or a secondary *ie/o*-present.

As for nominal derivatives, Germanic (e.g., PGm. **nēplō-* ‘needle’, Kroonen 2013: 388), Celtic (OIr. *snáth* ‘thread’ < **sn(o)h₁-to-*, Matasović 2009: 348–49), Italic (Lat. *nēmen* n. ‘yarn’) all lack **i*. This also holds for the Core Proto-Indo-European stem **sneh₁-ur/n-* ‘sinew’ (ToB *šñor** n. ‘sinew’; Skt. *snávan-* n. ‘sinew’ (AV+); Gr. *νευρά* f. ‘bowstring, sinew’; Lat. *nervus* m. ‘sinew, muscle, nerve’; Arm. *neard* ‘sinew, tendon’).⁵³

Conversely, Balto-Slavic and Indo-Iranian both have nominal derivatives containing *-i-*, showing that their creation must postdate the reanalysis of the suffix as part of the root. There are many parallels for this process in other Indo-European languages, e.g., **peh₃-* / **peh₃i-* / **peih₃-* ‘to drink’ (LIV: 462–63), and the lexicalization of the secondary root can in many cases be projected to the protolanguage, but in this case Balto-Slavic and Indo-Iranian also share the semantic development to ‘to churn’. This can hardly be an independent innovation in the separate branches: in Indo-Iranian, **naiH-* ‘to churn’ cannot be derived from **naiH-* ‘to lead’; in Baltic, ‘to churn’ cannot be derived from ‘(to) thread’.

As such, **neiH-* ‘to churn’ is a plausible formal (albeit rather trivial) and semantic (quite specific) innovation of Indo-Slavic.

⁵¹ This cannot be proven independently, however, since intervocalic *-i-* would be lost. Yet, the analysis is plausible from a morphological perspective (cf. Kloekhorst & Lubotsky 2014: 133).

⁵² Latv. *snāt* ‘to wind loosely, braid, throw around one’s shoulders’ is a potential exception, but the *o*-vocalism is unexplained (cf. Derksen 2015: 551). If it is related to **(s)neh₁(i)-*, the vocalism might indicate a denominal origin.

⁵³ Additionally, a secondary root **(s)neh₁u-* ‘to twist, wind’ may be reconstructed, reflected in Goth. *snīwan* ‘to rush’, RuCS *snuti* ‘to warp’, Latv. *snaujis* ‘noose’, and possibly Alb. *nus* ‘thread, string’. Potentially, **(s)neh₁u-* and **sneh₁-ur/n-* both derive from a *u*-present of **(s)neh₁(i)-*. Given that **sneh₁-ur/n-* must be reconstructed for Core Proto-Indo-European, this *u*-present is likely archaic and should not be regarded as a shared innovation of Germanic, Balto-Slavic and Albanian.

3.2.5. **som* ‘together, with’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Plausible	^N Derivation

Indo-Aryan: Skt. *sám* prev. ‘together, with, at the same time’ (RV+)

Iranian: OAv. *hām*, YAv. *hām* prev. ‘together’; OP *ha^m-gmata-* adj. ‘gathered’; MiP Pahl. *han-ĵaman*, Man. *han-zaman* ‘gathering, community’; MoP *an-ĵuman* ‘gathering, community’; Sogd. M *’njmn* ‘assembly’; Khot. *ham-* ‘together’; Oss. I *æm-byrd* / *D æm-burd* ‘gathering’

Baltic: Lith. *sù*, (dial.) *sà* prep. ‘(together) with’, *sam-*, *san-*, *sq-* pref. ‘together’; Latv. *sa* prep. ‘with’, *suô-* pref. ‘with’; OPr. *sen* prep. ‘with’, *sen-*, *san-* pref. ‘together’

Slavic: OCS *sъ* prep. ‘with’, *sq-* pref. ‘together’; Ru. *s(o)* prep. ‘with, from’, *su-* pref. ‘together’; Pol. *z(e)* prep. ‘with, from’, *sq-* pref. ‘together’; Sln. *s(à)* prep. ‘with, from’, *so-* pref. ‘together’

Indo-Iranian and Balto-Slavic both attest preverbs/prepositions and prefixes that may be united under the reconstruction **som*(-) ‘together, with’ (EWAia II: 702; LEW: 753; Vasmer II: 564; Derksen 2008: 462, 478; 2015: 388, 434). Already Schmidt (1872: 49) argued that the use of **som* (**sam* in his reconstruction) as a preverb constitutes an Indo-Slavic isogloss.

The Balto-Slavic reflexes require some additional discussion.⁵⁴ While the prefixal forms (e.g., Lith. *sam-*, OCS *sq-*) all reflect **som-* regularly, it has been argued that the prepositional forms derive from a secondary zero-grade **sum* << **sm̥* (Trautmann 1923b: 250). This assumption is not necessary, however, since final *-*om* would regularly yield PBSl. *-*un* (Kortlandt 1978a; Hill 2013), so that an orthotone **sóm* would yield **sun* < **sum*. This directly accounts for Slavic **sъ*. The use of *sъ(n)-* as a verbal prefix in Slavic is clearly secondary. Lith. *sù*, on the other hand, does not regularly reflect **sun* < **som* (the regular outcome would be **sy*). Possibly, *sù* reflects **sún̥* (shortened by Leskien’s Law), although the origin of the acute is unknown (Hock et al. 2019: s.v. *sù*).⁵⁵ Alternatively, *sù* could reflect **sun* with irregular loss of the final nasal. The vocalism of Old Prussian *sen* ‘with’ also looks irregular but can easily be analogical (cf. Kortlandt 2000; 2007). Finally, the origin of Latv. *sa* prep. ‘with’ is unclear, but given the irregular outcomes in Lithuanian and Old Prussian, it seems unlikely that Latv. *sa* reflects PIE **so* (pace LEW: 753). In sum, there is no need to reconstruct Pre-PBSl. **sm̥*; **som*(-) accounts for both the preposition and the prefix. This reconstruction is more economical and fits with the fact that the prepositional and prefixal forms have the same meaning (‘together, with’) but different distribution (free vs. bound morpheme).

⁵⁴ For a fundamentally different view on the Balto-Slavic material, see Dunkel (2014: 717ff).

⁵⁵ A similar scenario has been proposed for Lith. (dial.) *sà* ‘with’, if secondarily extracted from prefixal *sq-*. For the vacillating vocalism, cf. also Lith. *ùž* ~ Lith. (dial.) *až(ù)* ‘behind, beyond’.

The Indo-Iranian preverb **sam* may theoretically reflect either **sem* or **som*. Given the semantic and functional correspondence with Balto-Slavic **som* ‘together, with’ rather than PIE **sem-* ‘one’ (see below), however, it likely reflects the *o*-grade form.

The preverb **som* is clearly related to PIE **sem-* ‘one’, reflected in Gr. εἷς ‘one’, Arm. *mi* ‘one’, ToA *ša-*, ToB *še* ‘one’. Next to orthotonic **sem-* there is a compound form **sm-* reflected in Lat. *sem-*, *sim-* ‘once, one’ (e.g., *semel* ‘once’, *simplex* ‘having one layer’), Skt. *sa-* ‘one, together’, Av. *ha-* ‘one’, Gr. ἅ- ‘one, same’, Arm. *ham-* ‘one, same’ (e.g., *ham-hōreay* ‘having the same father’, Olsen 1999: 379), cf. the near identical compounds Skt. *sá-garbhya-* ~ Gr. ἀδελφεός lit. ‘of (one and) the same womb’. From **sem-* ‘one’, the pronoun **smHo-* ‘some, same’ was derived, reflected in Skt. *sama-* ‘anyone, someone’, YAv. *hama-* ‘anybody’, Goth. *suma-* ‘someone’, Gr. ἅμα ‘at the same time, together’,⁵⁶ as well as **somHo-*, reflected in Skt. *samá-* ‘like, same’, Av. *hama-* ‘the same’, Gr. ὁμός ‘common, similar’, OIr. emphatic 3sg.pron. *-som*, ON *samr* ‘same’, Arm. *omn* ‘someone’. The thematic stems **smHo-* and **somHo-* may both tentatively be derived from an athematic **s(o)m-H-*.⁵⁷ All the above formations may be reconstructed to (Core) Proto-Indo-European.

From this Core Proto-Indo-European state of affairs, where **sem-* and the derivatives based on it are exclusively nominal, **som* ‘together, with’ as a preverb is an innovation reflected in Indo-Iranian and Balto-Slavic. In these branches, **som* seems to have replaced a more archaic **kom* ‘with’, reconstructable based on Lat. *com-* pref., *cum* prep. ‘with; completely’, OIr. *co*, *cu* prep. ‘with’, Goth. *ga-* pref., *gan-iman-* ‘to take along’, and further Gr. κοινός ‘common, public’ < **kom-io-*, Hitt. =*kan* part. ‘?’, Skt. *kām* final part., OCS *kъ* ‘to’. In addition to being more widely attested than **som*, a further indication that **kom* is an archaism is that it has no known derivational base, unlike **som*. Evidently, **kom* was retained in peripheral functions in Indo-Iranian and Balto-Slavic.

As for potential extra-Indo-Slavic comparanda of **som*, a possible candidate is Hitt. =(š)*šan* ‘over, on; close to; for the benefit of, about’ (Eichner 1992: 46). While formally unproblematic, the function and semantics are not comparable to **som* ‘together’ or **sem-* ‘one’. Even if Hitt. =(š)*šan* would be a formal cognate, the shared function of **som* in Indo-Iranian and Balto-Slavic could still be seen as a shared innovation.

Further, there is North Germanic *sam-* ‘together’ (de Vries 1977: 461), which must be a secondary development from PGm. **sama-* ‘same’, cf. ON *samfæðra* ‘having the same father’, since final **-m* would have been lost in Proto-Germanic (e.g., **ga-* < **kom*).

Gr. ξύν-, σύν- ‘with, together’ has been assumed as an irregular cognate of Skt. *sám* etc. (Dunkel 1982, with lit.). While Dunkel acknowledges that ξύν- is attested already in Mycenaean *ku-su* and “patterns like an archaism in Homer” (1982: 57), he argues that σύν- is the original form, from which ξύν- arose though contamination with **kom-* ‘with’. Dunkel compares the initial **s-* in σύν- with Gr. σῦς ‘swine’ and δασύς ‘hairy’, hypothesizing a regular preservation of **s* before **u*. Besides the fact that both proposed

⁵⁶ Taken at face value, Gr. ἅμα suggests **smh₂e*, which would specify **smHo-* to **smh₂o-*, but *-a* could alternatively be a secondary adverbial element (Beekes 2010: 79). In view of the accent, Sihler (1973) argues that ἅμα is not derived from **smH-*.

⁵⁷ Perhaps specifically **s(o)m-h₂-*, with the same adjectival suffix as in **meg-h₂-* ‘much, large’.

parallels may be explained differently,⁵⁸ the problem is that the **u* in σύν-, if derived from **som*, must also be secondary, which Dunkel explains by extending the regular raising of **o* > **u* / *C*_[+labial]_]*N* to also include **s*. This hardly makes sense phonetically. Moreover, the irregular preservation of **s*- and the raising of **o* in σύν- are interdependent in this scenario, making the argument circular. Finally, the final **-n* of ξόν-, σύν- is not necessarily original, given the compound preposition μεταξύ. Greek also has a prefix ὅμ- ‘one, same, together’, which at face value looks like **som*-. However, unlike Indo-Slavic **som*, Gr. ὅμ- is strictly a nominal prefix that functions as a pre-vocalic allomorph of ἅ-, ἁμ- ‘one, same’. Accordingly, rather than reflecting **som*-, ὅμ- is more likely an analogical replacement of ἅμ- on the model of Gr. ὁμός, ὁμοῦ.⁵⁹

As no compelling cognates are found, Indo-Slavic **som* ‘together, with’ can be maintained as an isogloss and an innovation *vis-à-vis* **kom*.

3.3. Isoglosses: possible shared innovations

3.3.1. **b^(h)e*, **b^(h)eġ^h* ‘outside, without’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Root

Indo-Aryan: Skt. *bahís* adv. ‘outside, from outside, out’

Iranian: MiP Pahl. *bē* conj. ‘but’, Man. *byc* /*bēz*/ conj. ‘but’, Parth. *byc*, *byž* /*bēž*/ conj. ‘but; except for’, *byh* /*beh*/ adv. out, forth, away, outside’

Baltic: Lith. *bè* ‘without’; Latv. *bez*, (dial.) *be* ‘without’; OPr. *bhe* ‘without’

Slavic: OCS *bez*(ь) prep. ‘without’; Ru. *bez* prep. ‘without’; Pol. *bez* prep. ‘without’; SCr. *bez* prep. ‘without’

Meillet (1926: 173) mentions these words as an Indo-Slavic isogloss. The adverbial element **-is* (cf. Skt. *āviś*, p. 147), which characterizes Skt. *bahís* (EWAia II: 220), is not paralleled in Balto-Slavic, however (LEW: 38; Derksen 2008: 38). Yet, **-is* may have spread to *bahís* by analogy to *āviś* ‘evidently, manifestly’, *nīś* ‘out, forth, away, without’.

The prepositions MiP *byc*, Parth. *byc*, *byž* and adverb Parth. *byh* (Durkin-Meisterernst 2004), probably reflecting **b^ha-id* + **-čid* (cf. Jügel 2013), cannot be directly compared with Skt. *bahís*, but derive ultimately from **b^(h)e*. In this sense, they look closer to the Baltic forms.

Lith. *bè*, Latv. (dial.) *be* and OPr. *bhe* have no final consonant, unlike Slavic and Sanskrit. Latv. *bez* has it, but may be explained as a borrowing from Slavic. Latvian also

⁵⁸ Gr. σῶς ‘swine’ is a variant of ἴς ‘id.’, which looks like the regular outcome of PIE **suH-s*. The former could be borrowed from another Indo-European language or result from contamination (cf. Beekes 2010: 1425). Gr. δασύς ‘hairy’ has been connected to Hitt. *daššu-* ‘heavy, strong’, Lat. *dēnsus* ‘dense’, the semantic gap allegedly bridged by δανλός ‘thick, shaggy’ < **d̥nsu-lo-*, but the *-s* in δασύς is likely analogical (van Beek 2013: 250). Of course, δανλός is at the same time a counterexample to the supposed preservation of **s* before **u*.

⁵⁹ Gr. ἁμαρτή ‘at the same time’ seems to show the regular development of **sm-h₂r-to-* (Beekes 2010: 83), but the denominal verb is either ἁμαρτέω ‘to meet, come together’ or ὁμαρτέω. Beekes (2010: 1075) argues that the vocalism of the latter is secondary after ὁμός and ὁμοῦ.

has the variants *bes* and *beš*. According to Endzelin (1923: 497), the former may be due to devoicing of *bez* before voiceless consonants, whereas the latter is argued to derive from the adverb *bešā* ‘without’ < **be-tieh₂*-.

Baltic and Iranian thus seems to reflect **b^(h)e* as opposed to Slavic and Sanskrit **b^(h)eg^h*. It is possible that the addition of **-g^h* was a dialectal innovation of Indo-Slavic, but an archaism cannot be excluded.

3.3.2. **b^hrod^h-no-* ‘a (pale) horse colour’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation Root

Indo-Aryan: Skt. *bradhná-* adj. ‘pale ruddy, yellowish, bay’ (often of horses)

Iranian: –

Baltic: –

Slavic: CroatCS *bronъ* adj. ‘white (of horses)’; ORu. *bronii* adj. ‘white (of horses)’; Cz. *broný* adj. ‘white (of horses)’

Indo-Aryan and Slavic share a colour adjective **b^hrod^h-no-* used specifically to describe horses (EWAia II: 235; Derksen 2008: 64), which was listed as an isogloss by Schmidt (1872: 46). The exact meaning is not identical, however. An alternative etymology connects Skt. *bradhná-* to Lith. *blaĩdas* ‘cloudiness’ (cf. Derksen 2008: 47) but this root connection is semantically vague and contradicted by the Slavic **r*. The Slavic word has alternatively been connected to Gr. φαρύνει and φάρη (Hesychius) (see Vasmer I: 125), which is formally difficult.

Although **b^hrod^h-no-* is an isogloss, the root of the derivation is unknown, which could point toward an archaism. The Slavic word has alternatively been taken as an Iranian loan. The fact that the word is not attested in Iranian makes this explanation less plausible.

3.3.3. **b^hud^h-ro-* ‘attentive, awake’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: –

Iranian: YAv. *zaēni-buδra-* adj. ‘eagerly attentive, waking’

Baltic: Lith. *budrùs* adj. ‘vigilant’, OLith. *bùdras* adj. ‘vigilant’

Slavic: OCS *bъdrъ* adj. ‘alert, cheerful’; Ru. *bódryj* adj. ‘cheerful’; SCr. *bădar* adj. ‘cheerful, alert’

Avestan *-buδra-*, attested in a compound (AirWb.: 968), corresponds to OLith. *bùdras* (Petit 2004: 266) and OCS *bъdrъ* (Derksen 2008: 69). In Lithuanian this was eventually remodelled to a *u*-stem. The stem looks like a normal *ro*-adjective from the root **b^heud^h-*

‘to become awake’. This stem type is archaic, but it is nevertheless a possible shared innovation.

3.3.4. **d^heh₁i-nu-* ‘female mammal’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation Semantics

Indo-Aryan: Skt. *dhenú-* f. ‘(dairy) cow, female mammal’

Iranian: YAv. *daēnu-* f. ‘female mammal’; MiP Pahl. *dēnōdag* ‘female, milch cow’; Khot. *dīnū* ‘cow’; Khwar. *dy(n)* ‘woman’

Baltic: Lith. *dienì* f. ‘pregnant, with child (of cow, mare, sheep)’; Latv. *atdiēne*, *a[t]daïne* f. ‘a cow that calves already in its second year’

Slavic: –

Arntz (1933: 47) takes this stem as an Indo-Slavic isogloss.⁶⁰ The root is **d^heh₁i-* ‘to suck(le)’. Indo-Iranian has a feminine *u*-stem (EWAia I: 797). One could wonder whether it is derived within Indo-Iranian from the weak stem of *dhinoti* ‘to nurture’ (see LIV: 138), but this is unlikely since the feminines of *u*-stems generally end in *-ī*, cf. *pr̥thvī* (AiGr. II, 2: 467). Since neither Skt. *dhinoti* ‘to nurture’ < **d^hi-neu-* nor OIr. *denait* ‘they suck’ < **d^hen-* directly continue **d^hi-n-h₁-*, they may be secondary. To be noted is a category of deverbial nomina agentis (mostly from desideratives) in *-u-* that often correspond to abstract nouns in *-ā-* (cf. *dhénā-* f. ‘stream of milk, nourishing stream, stream of speech’), but the feminines of these *u*-stems generally have long *-ū-* (AiGr. II, 2: 468). Thus, the Indo-Iranian word rather looks like a substantivized *nu*-adjective (cf. AiGr. II, 2: 741).

In Baltic, feminine *u*-stems were generally remodelled to *i*-stems (Ambrazas & Schmalstieg 2018: 1658). As shown by Vanags (1989: 114), archaic feminine *u*-stems are attested in Old Lithuanian, so it is possible that this remodelling was quite recent. Lith. *dienì* reflects a circumflex root but Latv. *atdiēne* points to a laryngeal in the root (Derksen 2015: 127–28). The fact that neither Baltic nor Slavic has any other *n*-stem derivative from *d^heh₁i-* suggests that Lith. *dienì* ~ Latv. *atdiēne* is archaic within Balto-Slavic.

Thus, **d^heh₁i-nu-* is a compelling Indo-Slavic isogloss, derived from **d^heh₁i-* ‘to suck(le)’. Since not only the derivation but also the semantic specification of ‘suckling (one)’ >> ‘female mammal’ is shared, it may be an Indo-Slavic innovation.⁶¹

⁶⁰ Cf. already Schmidt (1872: 46), who compares Skt. *dhenā-* (sic) ‘cow giving milk’ to Lith. *dienà* ‘pregnant’, an uncertain variant of Lith. *dienì* (Derksen 2015: 127).

⁶¹ The human reference of Khwar. *dy(n)* ‘woman’ is surely secondary.

3.3.5. **d^hemH-* / **d^hmeH-* ‘to blow’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Root

Indo-Aryan: Skt. *dhámati* ‘to blow’

Iranian: YAv. ptc.int.med. *dāδmainiia-* ‘blowing up’; MiP Pahl. *dam-* ‘to blow’; MoP *damīdan* ‘to blow; to breathe’; Sogd. B *δm’k* ‘breath’; Khot. *dam-* ‘to blow’

Baltic: Lith. *dūmti*, *-ia* ‘to blow’; Latv. *dumt*, *-stu* ‘to become overcast, cloud over’

Slavic: OCS *dъmy* nom.sg.pres.ptc. ‘blowing’; ORu. *duti*, *dъmu* ‘to blow’, Ru. *dut’*, *dúju* ‘to blow’; Pol. *dąć*, *dmę* ‘to blow’; SCr. *đūti*, *dmēm*, *dūjēm* ‘to blow, inflate’

The root **d^hemH-* or **d^hmeH-* ‘to blow’ (cf. Skt. aor. *adh māś-*) is exclusive to Indo-Iranian (EWAia I: 775) and Balto-Slavic (Derksen 2008: 114–15; Derksen 2015: 145), as noted by Meillet (1926: 171–72) and Arntz (1933: 51).

The vacillating root structure in Sanskrit (*dhamⁱ-* / *dhmā-*) may originate from the vocalization of **d^hmH-* > **d^hamH-*. Based on this, Skt. *dhámati* has been derived from a root present or *tudāti*-present (Gotō 1996: 46, fn. 11). However, as it is not found in Iranian, it cannot be excluded that Skt. *dhmā-* is a secondary root variant, in which case Skt. *dhámati* may be taken at face value as a class I thematic present. In Balto-Slavic, the paradigm is generally built on a zero-grade **dumH-* (Smoczyński 2018: 264), but the infinitive PSl. **dōti* may point to an old full grade **domH-* (Pronk 2013: 130). The origin of the Balto-Slavic vocalization **um* < **ṃ*, although not unparalleled (see Stang 1966: 77), is unclear. Perhaps it is analogical from Lith. *dūmai* ‘smoke’, OCS *dymъ* ‘smoke’, like Oss. I *dymyn* / D *dumun* ‘to blow (up), smoke’ (cf. Cheung 2002: 24).

Because of these uncertainties, it is not possible to determine whether the Indo-Iranian and Balto-Slavic verbal stems go back to same formation, e.g., **d^hmH-é/ó-* (*tudāti*-present), **d^h(e)mH-* (root present), or **d^hémH-e/o-* (thematic present). Thus **d^hemH-* or **d^hmeH-* ‘to blow’ cannot be proven to be more than a root isogloss.

3.3.6. **d^hoH-neh₂-* ‘grains’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation Root

Indo-Aryan: Skt. *dhānā́* f. ‘roasted grains’

Iranian: YAv. *dānō.karš(a)-* ‘a kind of ant’; MiP Pahl. *dān(ag)*, Man. *d’ng* ‘seed, grain’; Bal. *dān* ‘grain’; Sogd. M *δ’n* ‘seed’; Khwar. *δ’n* ‘seed’; Khot. *dānā-* ‘grain, seed’; Shu. *δūn* ‘roasted grains’; Wakh. *δын* ‘(ritual meal of) roasted wheat’

Baltic: Lith. *dúona* f. ‘bread, bread grains, rye’; Latv. *duõna* f. ‘slice of bread, especially at the end of a loaf’

Slavic: –

Schmidt (1872: 46) and Arntz (1933: 47) list this stem as an Indo-Slavic isogloss. Hitt. ^{NINDA}*dannaš-* ‘a bread-like food’ should be considered as unrelated (*pace* Huld 2002; see further Tischler 1983–1994). Although it could be mechanically reconstructed as **d^hoh₁-n-os-*, it would require the highly implausible assumption of a secondary *s*-stem that was derived from a (thematic) *n*-stem. ToB *tāno* f. ‘seed, grain’ is a formally possible inherited cognate to the Indo-Iranian word, but the final *-o* and the close semantic match with Iranian rather suggest a borrowing from an Iranian source (Peyrot 2018: 259; Dragoni 2023: 122).

The Indo-Iranian and Baltic words (EWAia I: 787; Bailey 1979: 156; LEW: 111; Derksen 2015: 146) are thus the only attested reflexes of a stem **d^hoH-nēh₂-*. Peyrot (2018: 258) doubts the etymology, however, because of the homophonous Latv. *duona* ‘frame of a door, door jamb; bottom of a barrel; edge of a plate; a channel in the beater (of a loom)’, which in his opinion shows that Lith. *dúona* ‘bread’ and Latv. *duōna* ‘edge of a loaf’ derive from a word meaning ‘edge’, which subsequently acquired several specified meanings. Yet, a secondary meaning of Lith. *dúona*, cited in the LKŽ (s.v. *dúona*), is ‘bread grains, rye’, which supports the connection to Indo-Iranian.

The underlying root of **d^hoH-nēh₂-* is unclear. A common suggestion is **d^heh₁-* ‘to set, put’, with a meaning ‘what is put in the ground’ (Wodtko, Irslinger & Schneider 2008: 125), but the meaning of this root is too general to be compelling. Semantically, **h₂ed-* ‘to parch, dry’ would fit, but it is formally difficult. Thus, there is no convincing root from which **d^hoH-nēh₂-* could have been derived, which suggests a shared archaism of Indo-Iranian and Baltic. However, the possibility remains that it was derived from an unknown base in Indo-Slavic, or that it was borrowed.

3.3.7. **d^hor-eie/o-* ‘to hold, support’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^v Derivation

Indo-Aryan: Skt. *dhāráyati* ‘to hold, keep, support’

Iranian: OAv. 3sg.pres.inj. *dāraiiat* ‘to hold’, YAv. 2sg.pres. *dāraiiēhi* ‘to hold’; OP *dārayātiy* ‘to hold, have’; MiP Pahl. *dār-*, Man. *d’r-* ‘to hold, keep’; Sogd. BMS *δ’r-* ‘to have, hold’; Khwar. *δ’ry-* ‘to hold, have’; Oss. I *daryn* / D *darun* ‘to hold, put’

Baltic: Lith. *daryti*, *dāro* ‘to produce, work on, do’; Latv. *darīt*, *daru* ‘to do’

Slavic: –

Verbal forms of the root **d^her-* ‘to hold’ are exclusively attested in Indo-Iranian and Balto-Slavic (cf. LIV: 145).⁶² As for the verbal stem formation, both branches attest an *eie/o*-present, although with divergent semantics.

Skt. *dhārāya-* ‘to hold’, most frequently attested in the imperfect, various modal forms, as well as participles, is essentially synonymous with the perfect *dadhāra* ‘to hold’ (Jamison 1983: 95–96). The stem does not seem to have a causative meaning and is

⁶² Gr. (Hesychius) ἐνθρεῖν ‘to guard’ hardly belongs here (cf. Beekes 2010: 558). Hitt. *ter-²* / *tar-* ‘to speak, say’ is rather from a root **ter-* (Kloekhorst 2008: 870–71).

unlikely to be a recent derivative. The Sanskrit situation is mirrored in Iranian, where the stem develops the secondary meaning ‘to have’ in Old Persian and younger Iranian languages.

According to Fraenkel (LEW: 83), Lith. *darýti* (and Latv. *darīt* ‘to do’) are causatives to Lith. *derėti* ‘to be suitable, useful, handy’. However, since the productive causative to *derėti* is *děrinti* ‘to adjust, fit (etc.)’ (Smoczyński 2018: 213), *darýti* may rather be taken as an inherited formation from Proto-Balto-Slavic. The semantic difference *vis-à-vis* Indo-Iranian does not necessarily preclude a shared innovation, since the rather general meaning of the Baltic verbs could have developed from ‘to hold, support’, which presumably is the older meaning. It is noteworthy that the Baltic and Indo-Iranian verbs share the feature of transitivity.

3.3.8. *ǵelp- ‘to murmur, babble’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Root

Indo-Aryan: Skt. *jalp-* ‘to speak unintelligibly, murmur, babble’

Iranian: –

Baltic: Lith. *želpuoti, želpuoja* ‘to babble, chat’

Slavic: –

This etymology (see LEW: 1296) is not considered in EWAia (I: 580), where Skt. *jalp-* ‘to murmur (etc.)’ together with Skt. *jap-* (with the same meaning) is explained as an onomatopoeic root. However, given the formal and semantic correspondence to Lith. *želpuoti*, the etymology is difficult to reject, even if the root is onomatopoeic. The preservation of **l* in Sanskrit need not imply a recent formation, but may be conditioned by the following **p* (Schoubben 2019).

3.3.9. *ǵuelH-e/o- ‘to burn, shine’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^v Derivation

Indo-Aryan: Skt. *jvālati* ‘to burn’

Iranian: –

Baltic: OLith. *žvelanti* acc.sg.pres.ptc. ‘burning, glowing’, Lith. *žvilti, žvyla* ‘to shine, gleam’

Slavic: –

Arntz (1933: 40) followed the old comparison of Skt. *jvālati* ‘to burn’ to Lith. *žiūrėti* ‘to look at’ (IEW: 479), which is semantically unconvincing. A more plausible root cognate is Lith. *žvilti* ‘to shine, gleam’ (EWAia II: 607; Derksen 2015: 524). The root may also be reflected in ON *kol* n. ‘coal’, OIr. *gúal* m./f. ‘coal’ (Kroonen 2013: 309), although the latter requires a (secondary?) full grade *ǵoulH- that diverges from Skt. *jval̥-*.

Although the root is probably not uniquely Indo-Slavic, only Sanskrit and Baltic attest verbal stems from **ǵʰeuH-*. Lith. *žvilti* is generally taken as secondary (LIV: 170–71). According to Būga (RR II: 468), the OLith. participle *žvelant-* presupposes a thematic present that Smoczyński compares to Skt. *jvālati* (2018: 1766). This stem is a possible shared innovation, although it is difficult to rule out that the branches innovated independently.

3.3.10. **ǵʰeuH-e/o-* ‘to call, curse’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^v Derivation

Indo-Aryan: Skt. *hávate* ‘to call’

Iranian: YAv. *zauuaiti* ‘to curse’; Sogd. S *ʼzw-* ‘to call’

Baltic: (Lith. *žavėti*, *žāvi* ‘to attract, charm, conjure, curse’; Latv. *zavēt*, *zavēju* ‘to cast a spell’)

Slavic: OCS *zvati*, *zovŭ* ‘to call’; Ru. *zovát*, *zovú* ‘to call’; Pol. *zwać*, *zwę* ‘to call’; SCr. *zvāti*, *zòvēm* ‘to call’

The possible isogloss involves the stem formation and semantics of this verb (cf. Schmidt 1872: 50; Arntz 1933: 45). The root **ǵʰeuH*⁶³ is also attested in ToB *kwā-tār* ‘to call out to, invite’, which probably reflects the zero-grade **ǵʰuH-* of a root present (pace Adams 2013: 254), and in ON *geyja* ‘to bark; to mock’ < **ǵʰouH-ie-*. It may also be found in OIr. *guth* m. ‘voice’ < PCelt. **gutu-*, with pretonic shortening (Matasović 2009: 170). PGm. **guda-* ‘god’ has been connected (IEW: 313–14), but the short vowel cannot be explained by pretonic shortening, since this only occurred before resonants in Germanic. Arm. *jaunem* ‘to consecrate’ is hardly related given the *a* in the root.

Within Indo-Iranian, the thematic present stem appears to be archaic, given the correspondence between Skt. *hávate* and Sogd. *ʼzw-* ‘to call’. Formally, YAv. *zauuaiti* ‘to curse’ looks like a compelling cognate, having undergone a semantic shift from ‘to call’ (cf. Narten 1969). However, Humbach (1973: 95) argues that YAv. *zauua-* reflects a different root **ǵʰabʰa-*, on the basis of Khwar. *zβ-* ‘to curse’, whose *-β-* cannot reflect **-u-*. For the Avestan form, a connection to Skt. *hávate* remains attractive, but the Khwarezmian stem must then be explained from a zero-grade stem **ǵʰuH-* of unknown origin. In any case, the thematic stem of Sanskrit and Sogdian may be compared with OCS *zvati* ‘to call’ etc., as Schmidt (1872: 50) noted. This verbal stem is a potential Indo-Slavic shared innovation.

In LEW: 1293, Lith. *žavėti* ‘to attract, charm, conjure, curse’ is separated from **ǵʰeuH-*, but the etymology is quite compelling, if we assume a semantic shift from ‘to call’. Although Baltic has innovated a new stem, a semantic shift from ‘to call’ >> ‘to curse’ could be a shared innovation of Indo-Slavic, if YAv. *zauuaiti* ‘to curse’ indeed

⁶³ The root structure of **ǵʰeuH-* has been supposed to be secondary *vis-à-vis* **ǵʰueH-* (LIV: 181; Kümmel 2000: 608), as attested in Skt. (JB) *hvātar-* ~ YAv. *zbātar-* ‘caller’. However, this is more likely secondary, extrapolated from the present stem Skt. *hvāya-* ~ Av. *zbaia-* ‘to call’ < **ǵʰuH-ēie/o-* (similarly EWAia II: 811; Adams 2013: 254).

belongs here. Narten (1969: 52) rejected this idea, arguing that the meaning of YAv. *zauua-* ‘to curse’ developed within Iranian, since the Indo-Iranian ritual contexts where the stem was used were considered “Daēvic”; the original meaning ‘to invoke ritually’ shifted to ‘to invoke with unholy words’ >> ‘to curse’. This is possible, but not enough to reject a shared semantic innovation. However, in the phrase ON *goð geyja* ‘to mock the gods’, the Germanic cognate shows similar semantics to Baltic and Iranian, which leads to the conclusion that only the thematic stem of Indo-Iranian and Slavic is a possible shared innovation.

3.3.11. **ǵ^houH-o-* ‘call, invocation’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *háva-* m. ‘call, invocation’

Iranian: OAv. *zauua-* m. ‘invocation’

Baltic: –

Slavic: Ru. *zov* m. ‘call’; Bulg. *zov* m. ‘call’; Sln. *zòv* m. ‘call’

Arntz (1933: 45), building on Trautmann (1923b: 367), lists this verbal noun from **ǵ^heuH-* ‘to call’ as an Indo-Slavic isogloss, which is formally and semantically compelling. ON *goðgá* ‘improper behaviour, blasphemy’ reflects an independent formation **ǵ^houH-eh₂-*.

3.3.12. **ǵ^huel-* ‘to be bent, walk crookedly’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Root Semantics

Indo-Aryan: Skt. *hvárate* ‘to walk crookedly’, *hváras-* n. ‘trap, deceit’, *huraś-cít-* adj. ‘thinking in wrongful ways’

Iranian: YAv. *zbarənt-*, *zbarəmn-* ptc. ‘walking crookedly’, *zūrō.jata-* adj. ‘wrongfully killed’; OP *zura* adv. ‘wrongfully’; Oss. I *ævzær* ‘bad, evil’

Baltic: Lith. *žvilti*, *žvỹla* ‘to bow, bend, lean over’, (Žem.) *atžūlus* adj. ‘rude’; Latv. *zīlt*, *zīlstu* ‘to lean over (slowly), lie down, be idle’, *zvēlt*, *zvēļu* ‘to roll, knock over’

Slavic: OCS *zъlъ* adj. ‘bad, evil, wicked’; Ru. *zloj* adj. ‘bad, evil, wicked’; Pol. *zły* adj. ‘bad, evil, wicked’; SCr. *zǎo* adj. ‘bad, evil, wicked’

Arntz (1933: 53) listed this root as an Indo-Slavic isogloss. However, the relationship between the Indo-Iranian and Balto-Slavic forms, as well as possible external comparanda, is complicated.

The Indo-Iranian root **j^huar-* has been derived from **ǵ^huer-* and connected to Gr. θῆρ m. ‘wild animal’ (Schindler 1972: 37), Lith. *žvėrīs* m. ‘wild animal’ etc. However, this etymology is problematic, since the acute root in Baltic points to **ǵ^hueh₁r-* (Derksen 2015: 524). Instead, **j^huar-* may be connected to Lith. *žvilti* ‘to bow, bend, lean over’, OCS *zъlъ*

‘bad, evil, wicked’ etc., which seem to cover approximately the same semantic range as the Indo-Iranian forms.⁶⁴ However, while Indo-Iranian **j^huar-* is aniṭ (cf. Skt. *parihvṛt-*⁶⁵), certain Balto-Slavic forms point to a root-final laryngeal. Lith. *žvilti* points to **ǵ^hu_lH-*, whereas the corresponding Latv. *zvēlts* suggests **ǵ^hu_l-*. According to Derksen (2008: 551), the adjectival form reflected in Lith. (Žem.) *atžūlus* ‘rude’ points to a lengthened zero-grade of an acute root **ǵ^hu_lH-*. Yet, this form and OCS *zъlъ* ‘bad, evil, wicked’ etc. are difficult to account for if **ǵ^hu_lH-* is the original form, as the expected vocalization would be **ǵ^hu_lH-* > PBSl. **žvilH-*. I am therefore inclined to follow Smoczyński (2018: 1765) in treating the Baltic zero-grade **žvil-* as secondary to the full grade **žvel-* (attested in Lith. *nuožvelnùs* ‘diagonal’), to which the original zero-grade was **žul-*. The acute intonation of certain Lithuanian forms must then be considered as secondary.

In both branches, verbal forms continue the (presumably) original meaning ‘to be bent, walk crookedly’, whereas nominal forms reflect a metaphorical meaning ‘wrongful, evil, bad’, which may be a shared semantic development. In conclusion, **ǵ^huel-* ‘to be crooked, walk crookedly’ constitutes an Indo-Slavic root isogloss with a potential semantic innovation.

3.3.13. **g^(u)eHi-* ‘to sing’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Root

Indo-Aryan: Skt. *gā-* ‘to sing’, *gāyati* ‘to sing’

Iranian: YAv. *gā-* ‘to sing’; Sogd. C *ž’y*, M *j’y* ‘to speak, talk; Khot. *gāha-* ‘verse’; Yagh. *žoy-* ‘to read, sing; to study’; Yazg. *ǰay-* ‘to call’

Baltic: Lith. *giedoti*, *gieda* ‘to sing’; Latv. *dziēdāt*, *dziēdu* ‘to sing’

Slavic: –

Arntz (1933: 35) presents the Indo-Iranian and Baltic forms as an isogloss along with ORu. *gajati* ‘to caw, croak’ (cf. also Derksen 2008: 161; LIV: 183). However, I believe the latter to be an unrelated onomatopoeic formation that cannot be used in the discussion of the remaining material.

In Indo-Iranian, the root is either *gā-* or *gāy-* (cf. Kümmel 2020: 183). The former appears in inherited nominal forms such as YAv. *gāθra-* n. ‘sung prayer’ ~ Skt. *gāyatrā-* m./n. ‘singing, song’ (where the present stem has replaced the root), as well as in aorist stems. The latter, Skt. *gāy-*, is found in the present stem *gāya-* and related forms, as well as in clearly recent nominal forms such as *gīti-* f. ‘song’.⁶⁶

The root variant *gāy-* clearly originates in the present stem (EWAia I: 483 with lit.). As argued by Kulikov (2012: 83), *gāyati* ‘to sing’ is best analysed as a class I present (in line with Indian tradition), rather than a class IV *ie/o*-present (pace LIV: 183). The original

⁶⁴ A reconstruction with **l* is furthermore consistent with later Vedic (ŚB+) *hvālati* ‘to stumble’.

⁶⁵ The zero-grade is often metathesized, e.g., *-hruta-* ‘crooked’ (Lubotsky 1994: 100).

⁶⁶ Seemingly from **g^(u)iH-ti-*, but the lack of palatalization shows that *gīti-* was derived within Sanskrit (or that the anlaut was restored).

stem may have been **g^wH-oi-*. If the Middle and Modern East Iranian forms (with palatalization) belong to this etymon, they would be consistent with a reconstruction **g^wH-oi-*; in an athematic stem **g^wH-oi-* / **g^wHi-(V)* / **g^wiH-(C)*, palatalization would have taken place in some forms, after which it could be levelled (in Iranian) or eliminated from the paradigm (in Sanskrit). A thematic stem **g^weH-ie/o-* cannot account for this distribution.⁶⁷ However, see Steblin-Kamensky (1999: 200) for alternative proposals regarding the Iranian material.

Lith. *giedóti* ‘to sing’ is commonly believed to be derived from **g^weHi-*, but the origin of the extension **-d^(h)-* (which appears in all nominal and verbal derivatives), while frequent in Baltic, is unknown. In any case, it does not give reason enough to doubt the etymology, given the semantic and near formal correspondence. Like in Indo-Iranian, the *i*-suffix has become part of the root. While it is difficult to exclude a shared archaism, it is possible that the *i*-stem as well as the lexicalization of a secondary root **g^weHi-* is a shared innovation of Indo-Iranian and Balto-Slavic.

3.3.14. **g^woih₃-o-* ‘life’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *gáya-* m. ‘house, household, family, property’

Iranian: OAv., YAv. *gaiia-* m. ‘life, lifetime, lifestyle’

Baltic: –

Slavic: ORu. *goi* m. ‘piece, friendship’; OCz. *hoj* m. ‘abundance’; Sln. *gòj* m. ‘care, cultivation’

Indo-Iranian and Slavic share an *o*-stem (EWAia I: 467; AirWb.: 503; Derksen 2008: 173), ultimately derived from the root **g^weh₃i-* ‘to live’, which Arntz (1933: 45) lists as an isogloss. Lith. *gajūs* ‘vigorous’ may be derived from the *o*-stem (Derksen 2015: 162). Within the individual branches, this *o*-stem looks archaic, since the semantics are clearly lexicalized and since the **g^w* is unpalatalized unlike most attested verbal forms. The exact reconstruction largely depends on the reconstruction of the root **g^weh₃i-*, which has several different forms in the Indo-European languages.

Two distinct full grades are attested: **g^wieh₃-*, reflected in OAv. *jīātu-* m. ‘life’ and Gr. ζῶω ‘to live’, and **g^weih₃-*, reflected in Gr. βέομαι ‘will live’. Arm. *keam* ‘to live’ is unclear and may reflect either **g^wieh₃-* / **g^wi(i)h₃-*, a full grade **g^weih₃-* (LIV: 215), or **g^wh₃ei-* (Martirosyan 2010: 356). With Lubotsky (2011: 111ff), I assume that the root originates from an *i*-present to **g^weh₃-* (cf. Gr. βόσκω ‘to feed, tend’). Laryngeal metathesis would have created a paradigmatic alternation between the strong stem **g^wh₃-ei-* and weak stem **g^wh₃i-V* / **g^wih₃-C*. The *i*-suffix was subsequently reanalysed as part of the root (seen

⁶⁷ The quality of the laryngeal cannot be determined by Balto-Slavic evidence, since the alleged Slavic cognate has been removed. A reconstruction **g^weh_{2/3}-* has been argued to explain the non-palatalization in Sanskrit (cf. Ollett 2014), but the palatalization in Iranian shows that any reconstruction with full grade in the root is incorrect (since **g^weh₁-* would explain the Iranian but not Sanskrit forms).

in, e.g., **g^wh₃i-uo-* > **g^wi_h3-uo-* ‘alive’ with laryngeal metathesis, cf. Skt. *jīvā-* ‘alive’, Lat. *vīvus* ‘alive’ etc.). Because of the varying order of root consonants in the full grade and zero-grade(s) in the verb, deverbal derivatives repaired the root structure in various ways, including **g^wieh₃-* and **g^weih₃-*.⁶⁸ In Balto-Slavic, the pre-metathesized root structure was instead restored (at least in some derivatives), which is evidenced by the broken tone of Latv. *dzīvs* ‘alive’ (Kortlandt 1992: 237, fn. 4), the mobile paradigm of Lith. *gývas* ‘alive’, the final stress of Ru. *žílá* f. ‘lived’ (Kortlandt 1975b: 3).

Turning to Skt. *gáya-* etc., the non-palatalized anlaut and short root vowel point to PIIr. **gaiHa-* < **g^woi_h3-o-*. This reconstruction also fits ORu. *goi* < PSI. **gôjv*.⁶⁹ For Slavic, the preforms **g^wh₃eio-* or **g^wh₃oio-* are also possible, but the latter is incompatible with Indo-Iranian short **ā* in the root. In the former case we might expect laryngeal aspiration in Indo-Iranian (cf. Skt. *māh-* ‘great, strong, powerful’ < **meǵh₂-*), but as there are no clear examples of **h₃* causing aspiration (Kümmel 2018: 163), **g^wh₃eio-* remains possible. However, an *e*-grade in the root would be unexpected in a masculine verbal noun, which is why **g^woi_h3-o-* remains the most likely reconstruction. Since the root structure was elsewhere restored to **g^wh₃ei-* in Balto-Slavic, **g^woi_h3-o-* is likely old and may be compared directly with Indo-Iranian.

3.3.15. **g^(w)eh₂ǵ^h-* ‘to wade’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Root

Indo-Aryan: Skt. *gāhate* ‘to penetrate, step into the water, wade’

Iranian: Sogd. BMS ’γ’z, C ’γ’z ‘to begin’; Khwar. γ’z ‘to run’; Oss I *qazyn* / D *ǵazun* ‘to play, joke, enjoy (a game)’; Shu. *žōz-* ‘to run’

Baltic: Lith. *gōžti*, *-ia* ‘to overthrow, overturn, pour out’; Latv. *gāzt*, *-žu* ‘to overthrow, overturn, pour (out)’

Slavic: RuCS *izgaziti* ‘to ruin’; SCr. *gāziti* ‘to trample, wade’

The root **g^(w)eh₂ǵ^h-* is not attested outside Balto-Slavic and Indo-Iranian (LIV: 183). Skt. *gādhá-* n. ‘shallows, ford’ must be kept separate (EWAia I: 486) since the *ta*-participle Skt. *gāḍha-* < **gāž-d^ha-* shows that *gāh-* ended in a palatal. The Iranian forms further confirm this reconstruction (Cheung 2007: 96). The Baltic vocalism points to **-h₂-*.

Gr. βήσσα f. ‘wooded combe, glen’ has been connected (Beekes 2010: 213), but it is semantically distant. Moreover, it may be derived from βαθύς ‘deep, high’ and connected to OIr. *báidim* ‘to sink into the water’, Lat. *vadum* n. ‘ford’, Skt. *gādhá-* n. ‘shallows, ford’ < **g^weh₂d^h-*.

⁶⁸ See Lubotsky (2011) for more evidence for a similar derivational chain in other roots, which seems to have been quite common in Proto-Indo-European.

⁶⁹ A similar full grade is reflected in OCS *žito* n. ‘corn, fruits’, OPr. *geytye*, *geits* ‘bread’, probably cognate with Welsh *bwyd* m. ‘food, meat’.

The roots $*g^{weh_2d^h}$ - and $*g^{(wh)eh_2g^h}$ - ‘to wade’ appear to be semantically identical and may be analysed as extensions of $*g^{weh_2}$ - ‘to step’.⁷⁰ Since $*g^{weh_2d^h}$ - > Skt. *gādhá*- n. ‘shallows, ford’ is isolated in Indo-Iranian, the root seems to have been replaced by $*g^{(wh)eh_2g^h}$ -. In this context, the root extension $*-g^h$ ⁷¹ in $*g^{(wh)eh_2g^h}$ - could be seen as an innovation of Indo-Slavic.

3.3.16. $*g^{(wh)eld^h}$ - ‘to be greedy, desire’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Root

Indo-Aryan: Skt. *gardh*- ‘to be greedy, long for something’, *gárdha*- m. ‘desire’ (Pāṇ.)

Iranian: YAv. *gərəða*- ‘greedy’; Sogd. B *γγšc* ‘n’k ‘mean, stingy’

Baltic: –

Slavic: OCS *gladъ* m. ‘hunger’, RuCS *žlǫdǫti* ‘to desire’; Ru. *golód* m. ‘hunger’; Pol. *glód* m. ‘hunger’; SCr. *glād* f. ‘hunger, craving’, *žǫdjeti* ‘to desire’

Arntz (1933: 35) lists the root as an Indo-Slavic isogloss. Skt. *gárdha*- ‘desire’ would provide a formal correspondence to OCS *gladъ* etc., but in view of its relatively late attestation, it may be secondary. No other cognate derivatives seem to be attested (EWAia I: 474; Derksen 2008: 173, 565). Lith. *gardūs* ‘tasty’ has alternatively been connected to the Indo-Iranian root (LEW: 136), but remains semantically remote. Goth. *gredus* m., ON *gráðr* m. ‘hunger’ have also been connected, but are rather from $*g^hreh_1$ - (cf. Kroonen 2013: 187).

The initial velar is either plain or labiovelar. As for the aspiration, the only indication comes from Skt. *gṛtsa*- ‘clever, dexterous, wise’, which would unambiguously point to $*g^{(w)}$ - (PIIr. $*gṛd^h$ -sa-). However, semantically, *gṛtsa*- is not very close to *gardh*- ‘to be greedy’ and may be from a different root. Even if it is related, it is possible that *gṛtsa*- was derived after Grassmann’s Law had stopped operating, in which case *gardh*- might still reflect PIIr. $*g^hard^h$ -.

Szemerényi (1967: 8) proposed that $*g^{(wh)eld^h}$ - ‘to be greedy, desire’ derives from $*g^{wel(h_3)}$ -⁷² ‘to wish, want’ (Gr. βούλωμαι, OCS *želěti*, both ‘to wish, want’) with an extension $*-d^h$ -. The Slavic verb may alternatively be connected to Gr. ἐθέλω ‘to wish, want’ < $*h_1g^{wel}$ - (Beekes 2010: 377). Both alternatives would be semantically plausible as sources for $*g^{(wh)eld^h}$ -, even though the existence of a root extension is difficult to prove. If Szemerényi is right, $*g^{(wh)eld^h}$ - is a potential shared innovation of Indo-Iranian and Balto-Slavic. In any case, the root is an Indo-Slavic isogloss.

⁷⁰ This could potentially explain the relationship between Gr. βῆσσα ‘wooded combe, glen’, βάθος ‘deep, high’, and βένθος ‘depth’, if from $*g^{weh_2d^h}$ - and $*g^{wemd^h}$ - respectively, mirroring the suppletive roots $*g^{weh_2}$ - and $*g^{wem}$ - ‘to go’.

⁷¹ Cf. Gr. νήω ‘to swim’ with the variants νήχω, νάχω.

⁷² The reconstruction of a final laryngeal in $*g^{wel(h_3)}$ - ‘to wish, want’ is uncertain (cf. Beekes 2010: 377; LIV: 208). Perhaps Gr. βούλωμαι is ultimately derived from $*g^{welh_1}$ - ‘to throw’. Obviously, $*g^{welh_1}$ - (with a final laryngeal) could not have been the base of $*g^{(wh)eld^h}$ -.

3.3.17. **HoustHo-* ‘lip’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation Root

Indo-Aryan: Skt. *ósṭha-* m. ‘(upper) lip’

Iranian: YAv. *aošta-* m. ‘upper lip’, du. ‘both lips’; Khot. *auṣṭā* ‘lip’

Baltic: Lith. *úostas* m. ‘port, harbour, (dial., arch.) mouth of a river’; Latv. *uōsta* f. ‘port, harbour, mouth of a river’; OPr. *austo* ‘mouth’

Slavic: OCS *usta* n.pl. ‘mouth’; SCr. *ústa* n.pl. ‘mouth’; Bulg. *ustá* n.pl., *ustá* f. ‘mouth, opening’

Meillet (1926: 173) lists the Indo-Iranian, Slavic, and Prussian words as an isogloss. Since OCS *usta* ‘mouth’ and OPr. *austo* ‘mouth’ are morphologically plurals, it can be surmised that **HoustHo-* likely meant ‘lip’.

The East Baltic forms (LEW: 1167) were not included by Meillet, probably due to the irregular vocalism. However, Derksen (2001; 2015: 482) explains Lith. *-úo-*, Latv. *-uō-* as analogical from **h₁eh₃-s-* ‘mouth’, cf. Lith. *úoksas* m. ‘opening, cavity, hollow’. The regular vocalism is argued to be preserved in the denominal verb Lith. *áuscīoti* ‘to gossip, talk nonsense’, but this is convincingly rejected by Smoczyński (2018: 73–74).

Mallory & Adams (1997: 387) assume a similar development for Lat. *ōstium* n. ‘door, entrance; aperture, mouth’ (i.e., as replacing regular **ūstium* by analogy to *ōs* ‘mouth’), which, if correct, implies that the isogloss is non-exclusive. It may be argued that Romance evidence supports this scenario, since Spanish *uzo* ‘door’, French *huis* ‘door (to a house)’ etc. presuppose **ūstium*.⁷³ However, this form probably reflects a regular raising of **ō > *ū* before *-stj-*, cf. Romance **bīstius* ~ Lat. *bēstia* f. ‘beast’ (Rohlf’s 1921). Since *ōstium* has a plausible inner-Italic etymology, by assuming an adjective **ōs-to-* ‘having a mouth’ (de Vaan 2008: 436), it may be concluded that there is no reflex of **HoustHo-* in Italic, which remains exclusively Indo-Slavic.

Traditionally, all the above material has been derived from **ōus-* (IEW: 784–85). While a connection between PIE **h₁eh₃-s-* ‘mouth’ and **HoustHo-* ‘lip’ is semantically attractive, it is formally impossible (see further Wodtko, Irslinger & Schneider 2008: 390). Alternatively, deriving the latter from **h₂eus-*, the root of YAv. *uši* n.du. ‘ear (ahuric), intelligence’, Gr. *oũs* n. ‘ear’, Lat. *auris* f. ‘ear’, Goth. *auso* n. ‘ear’, Lith. *ausis* f. ‘ear’ etc., is semantically unconvincing. Since **h₂eus-* may ultimately derive from **h₂eu-* ‘to perceive’, the meaning ‘ear’ seems to derive from the notion of a perceiving organ, which could hardly develop into ‘lip’. Thus, there is at present no compelling root etymology for

⁷³ See FEW 7: 439, DCECH, RI–X: 726. A spelling *ustium* is attested from Hieronymus’ Epist. 16 onwards (late 4th century CE). An earlier variant *austium* (attested already in Plautus) is best explained as a “hyper-urban” variant of *ōstium*.

**HoustHo-* ‘lip’. If the aspirated Skt. *-th-* reflects a laryngeal,⁷⁴ the word is morphologically obscure, and it seems possible that it derives from a compound.

3.3.18. **h₁ong^(w)-l-* ‘coal’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *āṅgāra-* m. ‘coal’

Iranian: Sogd. B *’nk’yr* ‘hearth’

Baltic: Lith. *anglīs* f. ‘coal’; Latv. *uogle* f. ‘coal’

Slavic: OCS *oglb* m. ‘coal’; Ru. *úgol* m. ‘coal’; Cz. *uhel* m. ‘coal’; SCr. *ùgalj* m. ‘coal’

Schmidt (1872: 45) and Arntz (1933: 35) list the word for ‘coal’ as an Indo-Slavic isogloss, including MoP *angišt* ‘coal’, in which the suffix is unexplained, however (see EWAia I: 48). Gharib (1995: 41) tentatively reconstructs Sogd. B *’nk’yr* ‘hearth’ as PIr. **ham-garia-*, but the connection to Skt. *āṅgāra-* is attractive.

Arm. *acut* ‘coal’ has been connected to the above (cf. Martirosyan 2010: 18–21, with lit.), through the reconstruction *acut* < **awcút-o-* < **an^wk^w-ul-* < **h₁ng^w-ōl-*. However, this is formally problematic, since the loss of **w* before **c* does not seem to be regular, cf. Arm. *awj* ‘snake’ < **h₂ng^w-i-* and *awcanem* ‘to anoint’ < **h₃ng^w-nH-*.⁷⁵ Moreover, Arm. *acut* may alternatively be connected to ON *kol* n. ‘coal’, OIr. *gúal* m./f. ‘charcoal’, if derived from **Hǵoul-* (Witczak 2003).

In Balto-Slavic the word is inflected as an *i-* or *io-*stem (LEW: 10; Derksen 2008: 385; 2015: 55). Together with the long vowel in the *-l-* suffix of Indo-Iranian, we may reconstruct a hysterodynamic stem **h₁ong^(w)-l-*, which is a possible Indo-Slavic innovation. The root **h₁eng^w-* is likely the same as in Skt. *agní-* m. ‘fire, god Agni’, Lat. *ignis* m. ‘fire’ etc. (cf. de Vaan 2008: 297). The fact that there are no attested verbal stems connected to this root may indicate an archaism, but an innovation remains possible.

3.3.19. **h₁su-dru-* ‘made of good wood’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *sudrú-* adj. ‘made of good wood’

Iranian: –

Baltic: Lith. *súdrus* adj. ‘thick, dense, solid, tight, (dial.) lush, fertile’

Slavic: –

Arntz (1933: 47) listed this compound as an Indo-Slavic isogloss. For the Lithuanian word and its etymology, see LEW: 937 and Derksen (2015: 434). Lith. *súdrus* is isolated and has

⁷⁴ From the dual ending **-h₁?*

⁷⁵ Martirosyan’s (2010: 20) explanation, that Arm. *acut* ‘coal’ lost its **w* because it was pretonic, is unconvincing, since the same should have applied to *awcanem* ‘to anoint’ < **h₃ng^w-nH-* (cf. Klingenschmitt 1982: 181).

undergone Winter's Law, which implies an archaism within Balto-Slavic (Petit 2004). It is clearly a lexicalized compound, whose meaning has drifted considerably, assuming that the original meaning was 'made of strong wood'. Traditionally, OCS *sъdravъ* 'healthy' has been connected, but it is better kept apart (see p. 96).

Skt. *sudrú-* (cf. EWAia I: 721) is attested twice in the Rígvēda.⁷⁶ In RV VII.32, it is used as an adjective (acc.sg.f. *sudrvàm*):

RV VII.32.20cd

á va índram puruhūtám name girá nemím táṣṭeva sudrvàm

'I bend Indra, invoked by many, here to you with a song, as a carpenter bends a felly made of good wood' (Jamison & Brereton 2014: 922).

In my opinion, the metaphor is best understood if *sudrú-* is translated to 'solid', i.e., a solid felly made from a single piece of wood, rather than made of 'good wood'. In RV X.28.8, it is used as a noun (acc.sg. *sudrvàm*):

RV X.28.8

devāsa āyan paraśūm̐r abibhran vānā vṛścānto abhí viḍbhir āyan

nī sudrvàm dádhatō vakṣāṇāsu yātrā kṛpītam ānu tād dahanti

'The gods came; they carried axes; hewing the trees, they advanced with their clans toward (the ritual ground), depositing the good wood in the belly [=the hearth(s) of the ritual fires]. Where there is brushwood [?], they [flames?] burn it up' (Jamison & Brereton 2014: 1420).

Here, there seems to be an opposition between *sudrú-* 'good wood' and *kṛpīta-* 'brushwood', in which case *sudrú-* could also be translated as 'solid wood'. While the word clearly refers to wooden objects and is analysable as a compound within Vedic, both attestations may reflect the initial stages of the same type of lexicalization and semantic shift that evidently affected Lith. *sūdrus*. Although a shared archaism is difficult to reject, a shared innovation does not seem implausible, especially given the semantic similarity.

3.3.20. **h₁uk-ie/o-* 'to be(come) accustomed to'

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^v Derivation

Indo-Aryan: Skt. *ucyasi* 2sg.pres. 'you are accustomed to'

Iranian: –

Baltic: –

Slavic: ORu. *vyčē-* 'to learn'

Sanskrit and Russian seem to share a *ie/o-* present from **h₁euk-* 'to be(come) accustomed to'. The root form is attested in various stem formations in other branches, cf. Arm. *owsanim* 'to learn', OIr. *to-ucci* 'to understand', Lith. *jūnkti*, *-sta* 'to become accustomed',

⁷⁶ There only other Rígvēdic compound with *drú-* as the second member is *harídravaḥ* 'golden trees' (RV IV.43.1). This scarcity is consistent with taking *sudrú-* as an inherited compound.

also Goth. *biuhts* ‘accustomed’. Elsewhere in Slavic, the *ie/o*-stem has been replaced by a nasal stem, e.g., OCS *vyknŋti* ‘to get used to, accustom oneself’. Due to the long **ū-* of ORu. *vyčē-* ‘to learn’, the form has been taken as secondary (LIV: 244), but this may rather be explained as regular laryngeal metathesis **h₁uk-* > **uh₁k-* (cf. Pronk 2011).

It has been argued that *ucya-* is secondary in Sanskrit, as it replaces the perfect in post-Rigvedic texts (Kümmel 2000: 129; LIV: 244). However, given the Slavic parallel, it is difficult to exclude that the formation is old and simply adopted the function of the perfect in later Vedic. Still, an archaism cannot be excluded.

3.3.21. **h₂eu-r-eh₁* adv. ‘(over) there, downwards’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *arvāñc-* adj. ‘turned towards’ (RV+), *arvāvāt-* f. ‘proximity’

Iranian: OAv. *aorā-cā* adv. ‘downwards’; YAv. *aora* adv. ‘downwards’; OP *aurā* adv. ‘downwards’

Baltic: Lith. *aurė* ‘there, over there’, *aure* adv. ‘there, then, approximately’

Slavic: –

Fraenkel (LEW: 26) mentions that Lith. *aurė* ‘there, over there’ may be remotely related to Skt. *avār* ‘below’ and YAv. *auuarə* ‘downwards’, but this does not explain the final *-ė* of Lithuanian. Derksen (2015: 71) does not compare Lith. *aurė* to any Indo-Iranian forms, but mentions Gr. *δεῦπο* ‘(to) here’, which seems to reflect the adverb **δε* + an unknown element **-uro*.

We may rather compare Lith. *aurė* to PIIr. **HauraH*, reconstructable based on secondary derivatives in Sanskrit and the Iranian adverbs YAv. *aora* and OP *aurā*.⁷⁷ In Sanskrit, **aurā* underwent metathesis to **aruā*, cf. Hoffmann (1956: 9). The adverb **HauraH* must be Proto-Indo-Iranian since final **-r* gave *-ar* in both Indo-Aryan and Iranian, implying that a younger derivative would have given ***Hauarā*. Adverbial **-aH* likely reflects **-eh₁* as evidenced by the palatalization in Skt. *āchā* ‘to towards’, *uccā* ‘high, up’, *paścā* ‘after, later’ (cf. Lubotsky 2001a: 41). This makes a comparison to Lith. *aurė* even more likely, as it would regularly develop from **aurē* with shortening of the acute final vowel due to Leskien’s Law.⁷⁸

PIIr. **HauraH* and its Baltic correspondent may ultimately derive from an *r*-locative⁷⁹ **h₂eu-(e)r* of the deictic particle **h₂eu-*, which formed the basis of several pronominal forms in various Indo-European languages (see p. 144). This **h₂eu-(e)r*, in turn, is directly attested in Skt. *avār* ‘below’ and YAv. *auuarə* ‘downwards’. It should be noted

⁷⁷ Dunkel (2009) also connected Umbr. gen.sg. *orer* ‘of this one’, but can reflect either **oso-*, **ouso-*, **oiso-*, or **oro-* and is unlikely to be related (Untermann 2000: 804).

⁷⁸ A somewhat similar form is Lith. *rė* ‘ecce’, Latv. *re* ‘id.’ which is analysed as a shortened imperative from *regēti* ‘to see’. In principle, *aurė* could then be seen as *au-rė*, but the chronology is problematic since it would have to be a very early derivative for *au-* to retain the meaning ‘there’ (the preverb *au-* means ‘away’ in Balto-Slavic), whereas *regēti* looks more recent (cf. LIV: 498).

⁷⁹ For a discussion of *r*-locatives, see Bauhaus (2019).

that Gr. δεῦπο ‘(to) here’ can hardly be connected to Lith. *aurė* and YAv. *auuarə* (pace Beekes 2010: 319), since **de-h₂ur-o* would give Gr. ***δαῦπο*.⁸⁰ On the other hand, Arm. *ur* ‘where, where to’ may continue **h₂u-r*, which could be seen as a variant of **h₂eu-r* (see Martirosyan 2010: 644–45 for alternative etymologies). In any case, we may reconstruct an adverbial **h₂eu-r-eh₁* uniquely attested in Indo-Iranian and Baltic, which constitutes an Indo-Slavic isogloss and a possible shared innovation.

3.3.22. **h₃ieb^h-e/o-* ‘to copulate’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^v Derivation

Indo-Aryan: Skt. *yābhati* ‘to copulate’

Iranian: Bal. *šāf-* ‘to cover (a ewe), mate’ (+ **fra-*); Khwar. *by’βy-* ‘to make pregnant’ (+ **upa-*)

Baltic: –

Slavic: Ru. *etí, ebát’*, *ebú* ‘to copulate’; Pol. *jebać, jebię* ‘to copulate, scold, beat’; SCr. *jèbati* ‘to copulate’

Indo-Iranian and Slavic share a thematic present from **h₃ieb^h-* ‘to copulate; to enter’ (Derksen 2008: 147; Vasmer I: 388; Vaillant III: 158). The original meaning of **h₃ieb^h-* seems to have been ‘to enter’, which is preserved in ToB *yäp-* ‘to enter’, pres. *yānmā^{śske/śšä-}* (Malzahn 2010: 796; Peyrot 2013: 797). In Indo-Iranian, Slavic, and Greek (cf. οἶφω ‘to copulate’), this has developed into ‘to copulate’.⁸¹ Gr. οἶφω most likely reflects a reduplicated stem **h₃e-h₃ib^h-e/o-* (Cheung 2007: 175). Based on this, it is possible to regard the stem **h₃ieb^h-e/o-* as an Indo-Slavic isogloss, but it cannot be excluded that this is either an archaism from Core Proto-Indo-European or a result of independent innovations.

⁸⁰ One could argue that Gr. δεῦπο was formed after laryngeal colouring was no longer productive, but this is merely a possibility.

⁸¹ Iranian may preserve a separate reflex of the original root, e.g., Sogd. BM *y’β*, C *y’b*, ‘to wander, travel, rove’, often with a nasal infix (see further Cheung 2007: 212–13) reminiscent of the Tocharian present stem.

3.3.23. **keuH-* ‘to throw, shove, shoot’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Root

Indo-Aryan: –

Iranian: YAv. *spaiieiti* ‘throws’, *spāta-* ‘thrown’, *spāñhaiti* ‘will throw away’; OP *niy-asaya* ‘threw down’; Parth. *nyspy-* ‘to bend, bow’; MoP *bisūdan* ‘to handle, feel, touch, rub’; Sogd. S *spy-* ‘to throw away, reject’; OKhot. *paśś-* ‘to let go, release’, *niśś-* ‘to throw away’; Psht. *āsp-* ‘to collect, amass’

Baltic: Lith. *šauti, -na* ‘to shoot, (dial.) strike, hurl, push, shove’; Latv. *šaut, -ju, -nu, saūt, -nu* ‘to shove, strike, shoot’

Slavic: OCS *sunŋti* ‘to pour out’, *sovaatъ* (3sg.) ‘overflows’; Ru. *súnut’*, *súnu* ‘to shove, thrust’, *sovát’*, *sujú* ‘to shove, thrust’; Pol. *sunąć, sunę* ‘to shove, slide’, *suwać, suwam* ‘to shove, slide’; SCr. *súnuti, sūnēm* ‘pour, strew’

In Balto-Slavic, various verbal stems reflect a root **keuH-*, which in LIV: 330 is assigned the meaning ‘to throw, shove’. The vacillating anlaut of Latv. *šaut, saūt* and the consistent absence of palatalization of initial *s-* in Slavic likely reflect analogical levelling of PBSl. **šjou-* < **keuH-* from *o*-grade or zero-grade forms (cf. Derksen 2015: 441).⁸² The Balto-Slavic forms have been compared with ON *skjóta* ‘to shoot’ < PGm. **skeutan-*, with *s-*mobile in Germanic. However, as shown by Kroonen (2013: 445), the Germanic verb rather derives from PGm. **sket-*.

I would like to propose an Iranian cognate of the Balto-Slavic root. Among forms in several other Iranian languages, YAv. *spaiieiti* ‘throws’ has been argued to reflect PIIr. **ćuaH-* ‘to throw’, without further Indo-European cognates (Cheung 2007: 369; LIV: 339). This is problematic, as it requires the *ad hoc* assumption of shortening of **ā* before **i* in Avestan, Khotanese, and Old Persian (thus Emmerick 1968: 56). Rather, YAv. *spaiieiti* ‘throws’ reflects PIIr. **ćuH-āia-*, comparable to, e.g., Skt. *hvāya-*, Av. *zbaiia-* < **j^huH-āia-* < *ǵ^heuH-* ‘to call’. The only attested full grade forms of the supposed PIIr. **ćuaH-* ‘to throw’ are YAv. verbal adjective *spāta-* ‘thrown’ and aor.subj. *spāñhaiti* ‘will throw away’. The former is clearly secondary, as a zero-grade is expected. The *s*-aorist may also be secondary according to LIV: 399, since, in view of its semantics, a root aorist would be expected. The attested *sa*-subjunctive may thus be an Iranian innovation. It follows that the root structure of PIIr. **ćuaH-* ‘to throw’ as such may be secondary, based on the present **ćuH-āia-*. This is paralleled by Skt. *hvāya-*, OAv. *zbaiia-*, which yielded a secondary full grade attested in Skt. *hvātar-*, YAv. *zbātar-* ‘caller, invoker’. Thus, PIIr. **ćuaH-* ‘to throw’ likely derives from **keuH-*, and may be directly compared with the Balto-Slavic root discussed above. This constitutes an Indo-Slavic root isogloss.

⁸² The Slavic verb may alternatively be connected to Hitt. *šuyē/a-^{zi}* ‘to fill’ < **suH-*, which is closer semantically. Interestingly, Hittite has a homonymous *šuyē/a-^{zi}* ‘to push (away), shove, cast off’, which could be taken as a semantic parallel to the comparison of Lith. *šauti* ‘to shoot, (dial.) strike, hurl, push, shove’ and OCS *sunŋti* ‘to pour out’.

3.3.24. **kieh₁-mo-* ‘black, dark, grey’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *śyāmā-* adj. ‘black, dark-coloured’

Iranian: YAv. *sāma-* adj. ‘black’, *siiāmaka-* m. ‘name of a mountain’

Baltic: Lith. *šėmas* adj. ‘light grey, dark grey, bluish grey’; Latv. *sēms* adj. ‘variegated’

Slavic: –

An adjective **kieh₁-mo-* may be reconstructed based on Indo-Iranian (EWAia II: 661; AirWb.: 1571, 1631) and Baltic (LEW: 972; Derksen 2015: 443), which Arntz (1933: 43) listed as an isogloss.

Possibly, the root of **kieh₁-mo-* is ultimately an *i*-extended variant of **keh₁-*, reflected in Skt. *śasā-* m. ‘hare’, OHG *haso* m. ‘hare’ **kh₁-es-* ‘hare’, traditionally reconstructed as **kas-*. A similar scenario would explain ON *hárr* ‘hoary, grey-haired’, RuCS *sěrb* ‘grey’, OIr. *cíar* ‘dark-brown’ < **kh₁e/oi-ro-*. This would imply that **kieh₁-* was originally a verbal root, although no verbal forms are attested. Technically, it cannot be excluded that Lith. *šėmas* and Latv. *sēms* reflect an independent derivation from **keh₁-*, without the *i*-extension, since **i* is lost before **e* in Baltic, but this is rather uneconomical as it leaves the Baltic forms isolated *vis-à-vis* related forms in Balto-Slavic (e.g., Lith. *šývas* ‘light grey’) and Indo-European.

LEW: 972 further connects Lat. *cīmex* m. ‘bed-bug’ (< **kih₁-m-ek-*?) but this etymology is semantically unconvincing (de Vaan 2008: 114).

The Armenian toponym *Sim* ‘name of a mountain’ is connected to **kieh₁-mo-* by Martirosyan (2010: 683), who compares it to YAv. *siiāmaka-* ‘name of a mountain’ and Skt. *śyāmā-* ‘name of a river’. Although it is methodologically perilous to rely on onomastic evidence, the etymology finds some additional support by an alternative name of mount *Sim*: *Sewsar*, literally ‘black-mountain’. However, **kj-* does not seem to yield Armenian *s-*, cf. *lowc’anem* ‘to lighten’ < **louk₁-je-* (**k* < **k* / *u*_, *loys* < **leuk-o-*). A solution would be to reconstruct **kih₁-mo-*, which would be close but not identical to the Indo-Iranian and Baltic forms, given the zero-grade in the root.

Additional evidence for a zero-grade variant **kih₁-mo-* is Alb. *thimë* ‘grey’, which also has the advantage of being an impeccable semantic match of the Indo-Iranian and Baltic words. Besides Alb. *thimë*, the closest root cognate of **kieh₁-mo-* is **ki(e)h₁-uo-* (see p. 149), which is reflected in Indo-Iranian, Baltic and Germanic. Since the latter stem preserves traces of root ablaut, it was likely athematic originally. An original athematic *m*-stem could be assumed for **kieh₁-mo-* and **kih₁-mo-* too,⁸³ based on Alb. *thimë* (and the Armenian and Latin forms, if included). Baltic and Indo-Iranian would then have thematized the full grade form **kieh₁-m-*. It is also possible that **kieh₁-mo-* and **kih₁-mo-* are independent derivatives. Crucially, both scenarios constitute a possible shared innovation of Balto-Slavic and Indo-Iranian.

⁸³ However, an athematic *m*-stem adjective may be unparalleled and therefore not a very plausible reconstruction.

3.3.25. **k̑leu-os-* ‘word’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Semantics

Indo-Aryan: –

Iranian: OAv., YAv. *srauuah-* n. ‘word, saying, teaching; reputation’; MiP Pahl. *sraw* ‘word, spell’

Baltic: –

Slavic: OCS *slovo* n. ‘word’; Ru. *slóvo* n. ‘word’; Pol. *słowo* n. ‘word’; SCr. *slōvo* n. ‘letter (of the alphabet)’

Meillet (1926: 168) and Arntz (1933: 57) noted that only in Iranian and Slavic does **k̑leu-os-* mean ‘word’ (cf. AirWb.: 1643–44; Derksen 2008: 454) beside ‘fame’, cf. Skt. *śrávas-* n. ‘fame, praise, honour, reputation’, Gr. κλέος n. ‘rumour, fame, renown, reputation’, OIr. *chlú* n. ‘fame, rumour’. Given the root meaning of **k̑leu-* ‘to hear’, **k̑leu-os-* likely originally meant ‘what is heard’, which became ‘fame’ already in (Core) Proto-Indo-European.

It seems possible that the meaning ‘word’ either developed from ‘fame’,⁸⁴ or that it represents a parallel development from an original **k̑leu-os-* ‘what is heard’. Both scenarios imply a possible shared Indo-Slavic innovation, although an archaism cannot be excluded. Since the semantic correspondence is quite specific, independent innovations seem unlikely. Alternatively, it has been argued that the semantics of Slavic **slōvo* were influenced by Iranian (Benveniste 1967), which is impossible to verify but difficult to entirely rule out. In Balto-Slavic, **k̑leu-os-* ‘fame’ was replaced by OCS *slava* ‘glory, fame, magnificence’, Lith. *šlāvē* f. ‘honour, respect, fame’,⁸⁵ whereas in Indo-Aryan, **k̑leu-os-* ‘word’ is unattested.

3.3.26. **k̑op-o-* ‘straw (carried by water)’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation Root

Indo-Aryan: Skt. *śāpa-* m. ‘drift-wood, flotsam’

Iranian: MiP Pahl. *sabz* adj. ‘green, fresh’; MoP *sabz* adj. ‘green, fresh’; Bactr. σαβαγο ‘crop’; Psht. *sābā* m.pl. ‘greens, vegetables; a fodder grass’; Shu. *sēpc* ‘cultivated field’

Baltic: Lith. *šāpas* m. ‘straw, blade of grass, dry twig, chip, speck’, pl. *šāpai* ‘branches and grass that floodwater has carried onto a field; litter for animals in a barn; fish bones’

Slavic: –

⁸⁴ Cf. Italian *parola*, Spanish *palabra* ‘word’ < Lat. *parabola* ‘speech’ << Gr. παραβολή ‘comparison’.

⁸⁵ The variant Lith. *šlovė* ‘glory, fame’ has been regarded as a Slavic borrowing (Smoczyński 2018: 1409).

Arntz (1933: 36) listed Skt. *śāpa-* and Lith. *šāpas* as an Indo-Slavic isogloss. The etymology is accepted by Mayrhofer (EWAia II: 629) but doubted by Derksen (2015: 440). Būga (1922: 289) takes Lith. *šāpas* as a derivative of *šēpti* ‘to grow unevenly (of hair, beard)’, without cognates outside Lithuanian (cf. Smoczyński 2018: 1352). The connection is not entirely obvious, but could perhaps be understood if we assume that the original meaning of *šēpti* was ‘to strew’ vel sim. Thus, it cannot be excluded that *šāpas* is an inner-Lithuanian derivative, but, on the other hand, there is nothing against comparing it to Skt. *śāpa-* directly, reconstructing Indo-Slavic **kōp-o-* ‘straw (carried by water)’.

Skt. *śāpa-* ‘drift-wood, flotsam’ refers to small pieces of wood that a river carries downstream.⁸⁶ The meaning is remarkably close to Lith. *šāpai* ‘branches and grass that floodwater has carried onto a field’, the only difference being that the latter only has this meaning in the plural. Further potential cognates are Psht. *sābā* m.pl. ‘greens, vegetables; a fodder grass’ and Bactr. *σαβαγο* ‘crop’, which presuppose Plr. **čāpa(ka)-* (Morgenstierne et al. 2003: s.v. *sāb*’ə). The comparison is somewhat lacking, however, since the Iranian words refer to some type of edible plant, whereas the Sanskrit and Lithuanian words rather denote the opposite.

As for the etymology of **kōp-o-* ‘straw (carried by water)’, it is possible that it was derived from the root continued in *šēpti* ‘to grow unevenly (of hair, beard)’. Alternatively, it could be connected to **(s)kep-* ‘to chop, cut’ (cf. LIV: 555), if the *s*-less form was **kép-*, in which case Lith. *kāpti* ‘to cut, chop’ etc. must be secondary (**(s)kep-* > **(s)kep-* > **kep-*).

3.3.27. **kuen-to-* ‘holy, sacred’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: –

Iranian: OAv., YAv. *spānta-* adj. ‘holy’; MiP Pahl. *spandān* ‘mustard seed’, *spandarmad* ‘Holy Thought; the 12th month of the calendar’; MoP *isfand* ‘wild rue, *Peganum harmala*’

Baltic: Lith. *šveñtas* adj. ‘holy, sacred’; Latv. *svēts* adj. ‘holy, sacred’; OPr. *swints*⁸⁷ adj. ‘holy, sacred’

Slavic: OCS *svetъ* adj. ‘holy, sacred’; Ru. *svyatój* adj. ‘holy, sacred’; Pol. *święty* adj. ‘holy, sacred’; SCr. *svēt* adj. ‘holy, sacred’

Iranian (AirWb.: 1619–21) and Balto-Slavic (LEW: 1041–42; Vasmer II: 597–98) share an adjective **kuen-to-*, with practically identical semantics in the branches, noted as an isogloss by Schmidt (1872: 49), Meillet (1926: 169), Arntz (1933: 44), and Porzig (1954:

⁸⁶ Cf. RV VII.18.5d *śārdhantaṃ śimyum ucāthasya nāvyaḥ śāpaṃ sindhūnām akṛnod āsatīḥ* ‘Śimyu, who was vaunting himself above our newer speech—he [=Indra] made him into the flotsam of the rivers and his taunts (too)’ (Jamison & Brereton 2014: 904) and RV X.28.4b *idāṃ sū me jaritar ā cikiddhi pratīpām śāpaṃ nadyò vahanti* ‘Mark well this (speech) of mine, singer: The rivers carry the flotsam against their current’ (Jamison & Brereton 2014: 1419).

⁸⁷ The vocalism of OPr. *swints* has traditionally been seen as evidence that the word was borrowed from Polish (Trautmann 1910: 444), but according to Smoczyński (1989) it may reflect a regular change *e* > *i* / *_NC*.

167). In Indo-Aryan, the root is probably found in Skt. *śuná-* n. ‘prosperity, luck, welfare’ < **ḱun-o-* (EWAia II: 646), which together with YAv. *spanah-* n. ‘holiness’ shows that **t* is not part of the root. The fact that the corresponding verbal stems in Lithuanian, e.g., *švęsti* (*švenčiù*) ‘to sanctify’, are denominal indicates that Lith. *šveñtas* is not a productive deverbal adjective but an archaic formation. Although Latv. *svēts* is borrowed from Slavic (Derksen 2015: 456), Latvian preserves the root in the verbal stem *svinēt* ‘to celebrate’.

PGm. **hunsla-* ‘sacrifice’ is probably from the same root with the deverbal instrumental suffix *-*sla-* (cf. Kroonen 2013: 256–57). Hitt. *kunna-* ‘right, favourable, successful’ < **ḱun-no-* (Kloekhorst 2008: 493) is potentially also connected. According to Adams (2013: 252), ToB *kwants** ‘firm, steadfast, solid, constant’ may also be related, reflecting **ḱun-s-o-* ‘having swollenness’, although he acknowledges that the semantics are far from compelling. Mallory & Adams’ (1997: 493) reconstruction **kuntio-* must be rejected, since **ti* would yield Tocharian *c*.

The evidence suggests that **ḱuen-to-* is an exclusively Indo-Slavic derivative from an Indo-European root. If the Hittite root cognate is correct, the meaning ‘holy, sacred’ may be a post-Anatolian innovation shared with Germanic.

3.3.28. **ḱuoit-ó-* ‘white, bright’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *śvetá-* adj. ‘white, bright’

Iranian: YAv. *spaēta-* adj. ‘white’; MiP Pahl. *spēd*, Man. ‘*spyd* adj. ‘white’; Bal. *spēt* adj. ‘white’; Sogd. C *spty* adj. ‘white’; Khot. *śśīta-* / *śśīya-* adj. ‘white’; Shu. *sipēd* adj. ‘white’ (<< MoP?)

Baltic: (Lith. *šviēsti*, *šviēčia* ‘to shine’; Latv. *kvitēt*, *kvitu* ‘to shimmer, glimmer’)

Slavic: OCS *svěťb* m. ‘light, world’, *cvěťb* m. ‘flower’; Ru. *svet* m. ‘light, world’, *cvet* m. ‘flower’; Pol. *świat* m. ‘world’, *kwiat* m. ‘flower’; SCr. *svĭjet* m. ‘world, people’, *cvĭjet* m. ‘flower, bloom’

Arntz (1933: 44) listed **ḱuoit-ó-* as an Indo-Slavic isogloss. PGm. **hwīta-* / **hwitta-* ‘white’ has sometimes been adduced as a further cognate, despite its **t* instead of expected **p/ð* (EWAia II: 679), but the voiceless dental stop in the Germanic forms is rather a consequence of Kluge’s Law in a stem **ḱuit-nó-*, cf. Skt. *śvítna-* ‘white, light’ (Kroonen 2013: 267).

Slavic **svěťb* ‘light, world’ does not show the regular Balto-Slavic depalatalization of palatovelars before **u* + *V*_[+back] (Kortlandt 1978b, although the theory is not universally accepted; cf. Collins 2018: 1430). In all likelihood, the anlaut was taken over from the verb, e.g., OCS *světĭti se* ‘to shine’ (cf. Derksen 2008: 476). The regular depalatalized outcome is reflected in OCS *cvěťb* ‘flower’ < PSI. **kvěťb*. The anlaut **kv-* is also found in OCS *cvisti* ‘to bloom, blossom’ < PSI. **kvisti*. Since **kv-* is not regular here, the verb is probably denominal from **kvěťb*, which is further indicated by the semantics. In Baltic, no cognate of Slavic **svěťb* / **kvěťb* is attested, but Latv. *kvitēt* ‘to shimmer, glimmer’ (vs. Lith. *šviēsti*

‘to shine’, cf. Derksen 2015: 456, 541) suggests that a similar analogical interaction of noun and verb may have taken place here. The meaning of **kvēṛb* ‘flower’ likely goes back to ‘bright, light one’ and was lexicalized after the analogical form **svēṛb* ‘light, world’ took over the general meaning.⁸⁸

The Indo-Iranian forms, reconstructable as PIIr. **ćuaitá-* ‘bright, white’, are adjectives. However, given the oxytone accentuation, PIIr. **ćuaitá-* was probably originally a nomen agentis, i.e., ‘one who is bright, white’. Slavic **svēṛb* / **kvēṛb*, whose accent paradigm (c) reflects an original oxytone, could similarly be derived from ‘that which is bright, white’. Therefore, the fact that **k̑uoit-ó-* yields an adjective in Indo-Iranian, as opposed to a noun in Slavic, does not preclude a direct comparison of the attested stems.⁸⁹

It is probably not a coincidence that **k̑uoit-ó-*, a verbal noun, is exclusively attested in Indo-Iranian and Balto-Slavic, since these are also the only branches that attest verbal stems to the root **k̑ueit-* (cf. LIV: 340).⁹⁰ The root is otherwise only attested as an adjective in Germanic (Wodtke, Irslinger & Schneider 2008: 435).⁹¹ Possibly, **-it-* is analysable as a suffix appearing in colour terms, cf. Skt. *hárita-* ‘yellowish, green’, *palitá-* ‘grey’, *róhita-* ‘red’. This would allow **k̑ueit-* to be analysed as deriving from a root **kéu-* ‘to shine’, comparable to Gr. κοῖω ‘to notice’ and, with *s*-mobile, OHG *scouwōn* ‘to look at’.⁹²

In conclusion, the deverbal *o*-stem **k̑uoit-ó-* is a compelling Indo-Slavic isogloss. While it is difficult to exclude independent derivations, the fact that verbal stems from this root are exclusively attested in Indo-Iranian and Balto-Slavic, as well as the possibility that **k̑ueit-* is a secondary root, suggest that the verbal usage of **k̑ueit-* as well as **k̑uoit-ó-* are Indo-Slavic innovations. However, since a nominal stem formed from **k̑ueit-* is found in Germanic, it is difficult to exclude that the verbal stem and deverbal noun were lost here, as well as in other branches.

⁸⁸ This process is understandable as an example of Kuryłowicz’s fourth Law of Analogy (1945); the non-analogical form (**kvēṛb*) preserves a peripheral meaning (‘flower’) whereas the analogical form (**svēṛb*) takes the general meaning of the original lexeme (‘light, bright’), in this case synchronically derivable from the verb.

⁸⁹ A reconstruction **k̑ueito-* cannot be entirely ruled out for Indo-Iranian, however.

⁹⁰ However, there are no direct correspondences among the attested verbal stems. The closest correspondence is a nasal present Skt. *śvindate* ‘shines’ (Dhātup.) ~ Lith. *švisti, šviñta* ‘to become bright’, ORu. *sṽnuti* ‘to become bright, dawn’, which Amtz (1933: 44) took as an additional isogloss. However, the Sanskrit form is poorly attested and with an unexplained *d* for **t*, whereas inchoative nasal presents are productive in Balto-Slavic.

⁹¹ ToB gen.sg. *kušiñ* ‘of Kuča’ etc. has been adduced, but such onomastic evidence is semantically unconvincing. Additionally, there are alternative etymologies for the Tocharian material (cf. Adams 2013: 198).

⁹² A semantic development ‘to shine’ >> ‘to appear, be noticed’ is common crosslinguistically, cf. Eng. *shine* ~ Ger. *scheinen* ‘to appear’.

3.3.29. **k(o)rt-* ‘(one) time(s)’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Semantics

Indo-Aryan: Skt. *sá-kṛt* adv. ‘once’, *kṛtvās* adv. ‘– time(s)’

Iranian: YAv. *ha-kərət* adv. ‘once’; MiP Pahl. *hagriz* ‘ever’

Baltic: Lith. *kaĩtas* m. ‘once’

Slavic: OCS *kratъ* m./adv. ‘once, time’; Cz. *krát* m./adv. ‘once, time’; SCr. *krât* m./adv. ‘once, time’

Arntz (1933: 49) listed these formations as an Indo-Slavic isogloss. Indo-Aryan and Iranian share a compound form **-kṛt* ‘time’ and Sanskrit also has an adverb *kṛtvās* that seems to be a fossilized acc.pl. of a *u*-stem (EWAia I: 391–92; AirWb.: 1742–43). Balto-Slavic reflects a noun **korto-*, which is used adverbially in Slavic (Derksen 2008: 236; Derksen 2015: 229). These derivatives have been connected to various roots, such as **(s)kert-* ‘to cut’ and **k^wer-* ‘to cut; to make’ (LEW: 258; Smoczyński 2018: 496; Vasmer I: 657). In the latter case, the postpositions Osc. *-pert*, Umbr. *-per* ‘– time(s)’ have also been adduced, but they are more likely related to Lat. *-per* in, e.g., *semper* ‘always’ (de Vaan 2008: 459). Perhaps a more compelling etymology may be found in Skt. *kart-* ‘to spin, pull a thread’ < PIE **kert-* (LIV: 356),⁹³ with a semantic parallel in Lat. *duplex* ‘twofold’ < **plek-* ‘to plait, twine’ (and Lat. *duplus*, Gr. *διπλόος*, PGm. **fald-* < **pol-t-* ‘to fold, ply’).

While the Indo-Iranian and Balto-Slavic words are similar semantically and likely derive from the same root (possibly **kert-* ‘to spin’), no shared derivative can be reconstructed. It is possible that several stems were innovated in Indo-Slavic (e.g., a compound form **-kṛt* and simplex **kort-o-*), some of which were lost in the individual branches, leaving only the root connection and the semantics as a trace of the isogloss.

⁹³ ORu. *krjatati* ‘to move’, SCr. *krétati* ‘to move’ have been connected to Skt. *kart-* ‘to spin, pull a thread’, but the semantic connection is unclear. A semantically attractive cognate to the Sanskrit root is Hitt. *karza* n. ‘spool, bobbin’, although it is derivationally obscure (Kloekhorst 2008: 459–60). Gr. *κάριλλος* m. ‘(type of) basket’, Lat. *crātis* f. ‘construction of wickerwork, hurdle’, Goth. *haurds* f. ‘(lattice) door’ and OPr. *corto* ‘fence’ have also been derived from **kert-* ‘to spin’. However, while the Greek word may be non-Indo-European, the Latin word reflects **krh₂-ti-*. Given the formal similarity, the Gothic word and its Germanic cognates likely reflect the same formation.

3.3.30. **krs-no-* ‘black’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation Root

Indo-Aryan: Skt. *kṛṣṇá-* adj. ‘black’

Iranian: (YAv. *karšnaz-* ‘name of an Iranian family’; Elam. *kur-iš-na* ‘PN’; Yi. *k’uṇṇo* ‘magpie’)

Baltic: Lith. *kišnas* adj. ‘black (of a horse)’, *Kirkšnó-upis* ‘name of a river’, (*kéršas* ‘spotted white and black’); OPr. *kirsnan* adj. ‘black’

Slavic: OCS *črъnъ* adj. ‘black’; Ru. *černyj* adj. ‘black’; Pol. *czarny* adj. ‘black’; SCr. *crn* adj. ‘black’

Based on Indo-Iranian (EWAia I: 397–98; AirWb.: 459) and Balto-Slavic (LEW: 245; Derksen 2008: 92; Derksen 2015: 247), a colour adjective **krs-no-* ‘black’ may be reconstructed, which was taken as an Indo-Slavic isogloss by Schmidt (1872: 47), Arntz (1933: 43) and Porzig (1954: 167). The etymology of YAv. *karšnaz-* and Elam. *kur-iš-na* (which possibly continues an Old Persian reflex of **krs-no-*, cf. Tavernier 2007: 233) must be considered uncertain, since they are names. Yidgha *k’uṇṇo* ‘magpie’ and corresponding Modern Iranian forms (cf. Morgenstierne 1938: 221) may continue **krs-no-*. Lith. *kišnas* lacks the RUKI development of **s* and may be a borrowing from another Baltic language (often labelled “Yotvingian”, cf. LEW: 245).⁹⁴ Given the Prussian and Slavic cognates, however, **krs-no-* is securely reconstructable for Proto-Balto-Slavic.

A form that is often adduced is Alb. *sórrë* f. ‘crow’ (Demiraj 1997: 355; Orel 1998: 399, with literature), which would demand a reconstruction **k^wērs-neh₂-* (since **k* allegedly palatalizes to Alb. *q*, but see 1.3 above). There are several problems with this etymology. First, the Balto-Slavic vocalization of **r* points to a plain velar anlaut **k-* (perhaps < **k̑-* with depalatalization?), although this is controversial. Second, there are many possible alternative reconstructions of Alb. *sórrë*, e.g., without **s* in the root or with anlaut **ku-*. Third, the semantics of Alb. *sórrë*, although not incompatible with ‘black’, rather suggest that it should be compared with SCr. *svrāka* ‘magpie’, or even Lat. *cornix* ‘crow’, which are likely onomatopoeic.

A possible root cognate of **krs-no-* is Du. *harder* ‘grey mullet’, Sw. *harr* ‘grayling’ < PGm. **harzu-* < **kors-u-* (IEW: 583).

As noted by Debrunner (AiGr. II, 2: 735), the root of **krs-no-* ‘black’ is isolated and not attested in verbal stems. The root has previously been taken as the base of Lith. *kéršas* ‘spotted white and black’ (LEW: 245), but given the acute intonation this is unlikely to be correct. Consequently, it could be argued that **krs-no-* is a shared archaism, as there is no reconstructable base for deriving it at a hypothetical Indo-Slavic stage. Yet, since it cannot

⁹⁴ This might also explain the specific meaning ‘black (of a horse)’, assuming that the word was borrowed in a trade context or other culturally significant setting.

be excluded that a productive root **kers-* may have been lost within Indo-Slavic or independently in the branches, **krs-no-* is a possible shared innovation.

3.3.31. **kseud-* ‘to make small; to spray’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Root

Indo-Aryan: Skt. *kṣod-* ‘to spray, pulverize’, *kṣudrá-* adj. ‘minute, tiny’, *kṣódas-* n. ‘swell of the sea’

Iranian: YAv. *xšudra-* adj. ‘liquid, fluent’, *xšaodah-* n. ‘swell of the water’; MiP Pahl. *šōy-*, Man. *šwy-* ‘to wash’; MoP *šustan* ‘to wash’

Baltic: –

Slavic: OCS *xudъ* adj. ‘poor, insignificant, small’; Ru. *xudój* adj. ‘thin, lean, bad’; Pol. *chudy* adj. ‘thin, lean, insignificant, poor’; SCr. (dial.) *hūd* adj. ‘bad, evil’

Arntz (1933: 37) listed this root as an Indo-Slavic isogloss. The Indo-Aryan and Iranian *ro-*stems are not to be separated (EWAia I: 439); rather, Iranian reflects a semantic change from ‘to spray (of water)’ to ‘to flow’, which is also evident in Skt. *kṣódas-* n. ‘swell of the sea’. Semantically, Skt. *kṣudrá-* ‘minute, tiny’ is closest to Slavic **xūdъ* ‘small, thin’, where the circumflex root (despite Winter’s Law) is due to Meillet’s Law (Derksen 2008: 206).

Lith. *skaudrūs* ‘streaming (of water)’, Latv. *skaudrs* ‘harsh, unpleasant’ have been connected (EWAia I: 439), but cannot be compared directly to the *ro-*adjective of Indo-Iranian. These words rather belong with Lith. *skaudėti* ‘to hurt, experience pain’ (see further Smoczyński 2018: 1188).

In conclusion, there seems to be nothing against taking **kseud-* as an Indo-Slavic isogloss,⁹⁵ yet there is no indication that this root would be a shared innovation.

3.3.32. **k^wer-* ‘to perform magic’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Semantics

Indo-Aryan: *kārtra-* n. ‘spell, charm’, *kṛtyá-* f. ‘curse, spell, magic’, *abhicārā-* m. ‘exorcism, incantation, employment of spells for a malevolent purpose’ (AV+)

Iranian: YAv. *cārā-* f. ‘remedy’; MiP Pahl. *čārag* ‘means, remedy’

Baltic: Lith. *kerai* m.pl. ‘sorcery’, *kerėti* ‘to cast a spell, bewitch; to predict’

Slavic: OCS *čary* acc.pl.m. ‘magic, sorcery’, RuCS *čara* f. ‘sorcery’; ORu. *čara* f. ‘sorcery’, Ru. *čary* m.pl. ‘magic, enchantment’; Pol. *czar* m. ‘charm, enchantment’ SCr. *čara* f. ‘magic, sorcery’

⁹⁵ Albanian *hedh-* ‘to throw, shoot; to dart off; to winnow’ is probably unrelated, if it is true that **ks* > Alb. *sh*, (Demiraj 1997: 57). In any case, the semantic connection is not very strong.

Arntz (1933: 45) compared specifically the \bar{a} -stems YAv. *cārā-* ‘remedy’ to RuCS *čara* ‘sorcery’. However, the co-existence of an \bar{a} -stem and an o -stem within Slavic, both with lengthened \bar{e} -grade, as well as the full grade in Lith. *keraĩ*, suggests that a root noun should be reconstructed for Proto-Balto-Slavic (Kortlandt 1985: 118).

While there are no direct cognates, the shared semantics of these Sanskrit and Balto-Slavic derivatives, which all seem to be derived from a root $*k^{wer}$ - ‘to perform magic’, is striking. The root is generally thought to be identical to k^{wer} - ‘to do, make’, reflected in, e.g., Skt. *kṛṇóti* ‘to do, make’ (EWAia I: 308–9; Smoczyński 2018: 527),⁹⁶ in which case $*k^{wer}$ - ‘to perform magic’ must be regarded as a semantic innovation. It is difficult to exclude that this innovation is independent, however, given the semantic parallel in Gr. *πραξις* f. ‘doing, business; (magical) operation, spell’ from *πράσσω* ‘to pass through; to finish, accomplish, do’.

Gr. *τέρας* n. ‘sign, emblem; wonder, monster’, if from $*k^{wer}$ -, has been argued to show a similar semantic development relating to ‘magic’ (Beekes 2010: 1467–68). However, the basic meaning seems to be ‘sign’, which is not necessarily derived from ‘to perform magic’. It is perhaps closer to OIr. *cruth* m. ‘shape, form’ < $*k^{wer}$ - ‘to cut’. Alternatively, Gr. *τέρας* may be derived from $*k^{werh_2-s}$ - and connected to the Celtic name *Prasutagus*, containing PCelt. $*k^{wrh_2-stu}$ - (David Stifter, p.c.; for the attestations, cf. Delamarre 2006).

3.3.33. $*mentH-eh_1$ - ‘(wooden) tool for stirring’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *mánthā-* m. ‘churning stick, whisk’

Iranian: (Bal. *mant-* ‘to churn’; Sogd. B *mnō-* ‘to agitate, stir’; OKhot. *maṃth-* ‘to churn, stir’)

Baltic: Lith. *mentė*, *meñtė* f. ‘shoulder blade, paddle, trowel, shovel’, *menčià* f. ‘churning stick’, *mentis* f. ‘twirling stick for kneading bread dough’; Latv. *meñte* f. ‘ladle, stirring spoon, flat wooden shovel’

Slavic: (OCS *męsti*, *męto* ‘to trouble, disturb’; Sln. *męsti*, *mętem* ‘to disturb, churn’)

Skt. *mánthā-* m. ‘churning stick, whisk’ is inflected like *pánthā-* m. ‘road, path’ < PIIr. $*pant-aH-$ and is compatible with a reconstruction $*mentH-eh_1$ -,⁹⁷ which may be compared

⁹⁶ In turn, k^{wer} - ‘to do, make’ is likely a semantic innovation based on Indo-Anatolian $*(s)k^{wer}$ - ‘to cut’, cf. Hitt. *kuer-* ‘to cut’, OHG *sceran* ‘to cut’ etc., shared by Indo-Iranian (Skt. *kṛṇóti* ‘to do, make’ etc.), Celtic (cf. MWelsh *peri* ‘to cause, create, make’, Welsh 1sg.pres. *paraf*, MBret. 3sg.pret. *paras*, as well as OIr. *cruth* m. ‘shape, form’, *creth* ‘poetry’, MWelsh *pryd* m. ‘form, shape, time’, MBret. *pred* m. ‘moment’ < PCelt. $*k^{writu}$ -), and Balto-Slavic, if Lith. *kūrti* ‘to light a fire; to build, furnish (a house, boat); to create, found’ is connected (cf. Smoczyński 2018: 641–42; see Derksen 2015: 267 for a different view). Matasović’s (2009: 182) gloss of PCelt. $*k^{writu}$ - ‘magical transformation, shape’, indicating a connection to magic, similar to the Indo-Iranian and Balto-Slavic situation, does not seem to be supported by the attested forms.

⁹⁷ An alternative reconstruction is $*ment-eh_1$ -, in which case the aspiration in Skt. *mánthā-* can be from the weak stem. However, the verbal forms point to $*mentH-$. To explain the final laryngeal, it may be argued that the verbal

with Lith. *mentẽ*. The root is also attested in Balto-Slavic verbal stems, e.g., Lith. *mẽsti* ‘to mix’, OCS *męsti* ‘to trouble, disturb’ (EWAia II: 312; LEW: 437). As for the root structure, Skt. *mánthati* ‘to whirl, stir, shake’ suggests a root-final laryngeal (cf. LIV: 438–39). This is confirmed by Skt. *mathnāti* ‘to rob, take away’ ~ ToB *māntānā-* ‘to stir, touch’ < **mnt-ne-H-* and Skt. *mathāyāti* ‘to rob, take away’ ~ ToB *māntāññ-* ‘to destroy’ < **mnt-n-H-ie/o-* (for the meaning, cf. Malzahn 2010: 479, 753). Synchronically, Sanskrit distinguishes *manthi-* ‘to whirl, stir, shake’ from *mathi-* ‘to rob, take away’, but the Tocharian cognates suggest that they go back to one and the same root (*pace* EWAia II: 298; cf. Pronk 2019: 143).

The main argument against taking **mentH-eh₁-* as an Indo-Slavic isogloss is that Lith. *mentẽ* could be a productive formation from *mẽsti* ‘to mix’, like Lith. *mentūris* ‘mashing stick, churning stick’ and Latv. *mieturis* ‘id.’.⁹⁸ However, *ẽ*-stems are not normally instrument nouns in Baltic,⁹⁹ and *mentẽ* with its variants *menčià* and *mentis* rather behaves like an old root noun. This suggests that Lith. *mentẽ* may rather be an archaic stem, cognate to Skt. *mánthā-*, which was transferred to the *ẽ*-stem inflection (and thus feminine gender) within Baltic.

3.3.34. **miḱ-ro-* ‘mixed’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *miśrá-* adj. ‘mingled, blended’

Iranian: –

Baltic: Lith. *mišras* adj. ‘mixed’

Slavic: –

The *ro*-adjective reflected by Skt. *miśrá-* and Lith. *mišras* was taken as an Indo-Slavic isogloss by Arntz (1933: 51; see further EWAia II: 357; LEW: 450).

A root **meiḱ-* / **meig-* ‘to mix’ is well attested, cf. Lith. *miẽsti* ‘to mix’, OCS *měsiti* ‘to mix’, Lat. *misceō* ‘to mix, blend’, OE *miscian* ‘to mix’, OIr. *mesc* adj. ‘confused’, and Gr. μίσγω ‘to mix, bring together’ (with unclear voiced **ǵ*, cf. Beekes 2010: 920).¹⁰⁰ In Sanskrit, the root has largely been replaced by *mekṣ-*, an *s*-extended variant of **meiḱ-*.¹⁰¹ However, the bare root is continued in Khw. *amišt* ‘mixed’. In Iranian, **meiḱ-* is continued in YAv. *mīšti* ‘together’ and reflexes of **meig-* are widespread (cf. Cheung 2007:

forms are ultimately derived from a nominal stem **ment-eh₁-*, rather than the other way round, but such a scenario is difficult to substantiate.

⁹⁸ Latv. *meňte* ‘ladle, stirring spoon, flat wooden shovel’ is irregular and was likely borrowed from another Baltic dialect.

⁹⁹ Lith. *daļģis*, *daļģė* ‘scythe’ could be analysed as an instrument noun from an unattested **dalgýti* ‘to mow’ (cf. Smoczyński 2018: 193), but see LEW: 81 for a different etymology.

¹⁰⁰ Perhaps **meig-* was the original root shape, with **meiḱ-* emerging as a secondary variant based on the present stem **miḱ-ske/o-*, where the **ǵ* may have been devoiced.

¹⁰¹ Skt. *sāmmiśla-* ‘close-linked’ etc. may contain an *l*-variant of *miśrá-* or continue a separate formation from the same root. The form Skt. ptc.med. *michamāna-* ‘vivid’ could possibly reflect **mi(k)-ske/o-*, but the translation is unclear. In any case, *micha-* could not have provided a model for the restoration of **ḱ* in *miśrá-*, since here it would have been lost, cf. *prchāti* < **pr(k)-ske/o-*.

261),¹⁰² implying that the extension to *mekṣ-* in Sanskrit is a post-Proto-Indo-Iranian development.

In both Indo-Iranian and Balto-Slavic, Indo-European palatovelars seem to have been depalatalized to plain velars before **r* (Kortlandt 1978b), implying that the palatal in **mik-ro-* must have been restored based on other formations. The restoration of **k̑* may have been a shared Indo-Slavic development, but independent restorations in Indo-Iranian and Balto-Slavic cannot be excluded. In any case, the stem **mik-ro-* is an Indo-Slavic isogloss.

3.3.35. **mosg^h-en-* ‘brain, marrow’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *majjān-* m. ‘marrow’

Iranian: —¹⁰³

Baltic: Lith. (dial.) *smāgenys* m.pl. ‘brain, marrow, gum’; Latv. *smadzenes* f.pl. ‘brain, marrow, gum’; OPr. *mulgeno* [*musgeno*] ‘marrow’

Slavic: RuCS *moždeni* m.pl. ‘brains’; Plb. *müzdin* m., *müzdenü* n. ‘brain’; SCr. (dial.) *moždēna* n.pl. ‘brain’

An *n*-stem **mosg^h-en-* may be reconstructed based on Indo-Aryan (EWAia II: 291–92) and Balto-Slavic (LEW: 837; Derksen 2008: 328; Derksen 2015: 413), which was taken as an isogloss by Schmidt (1872: 47) and Arntz (1933: 49). The East Baltic forms, if related, must have undergone metathesis. It has been argued that the words instead originate as lexicalized participles of Lith. *smōgti* ‘to hit, strike’ (cf. LEW). OPr. *musgeno*, which is more similar in its consonantism to the Slavic and Indo-Iranian material, is also irregular, as *u* does not reflect **o*. However, RuCS *moždeni* ‘brain’ and the other Slavic forms probably reflect an old *n*-stem.

Besides the *n*-stem, YAv. *mazga-* m., OCS *mozgъ* m., ON *mergr* m. ‘marrow’, and possibly Mlr. *medg*, *medc* m. ‘whey’ continue a parallel stem **mosg^h-o-* ‘brain, marrow’.¹⁰⁴ There is no indication that this *o*-stem is derived from **mosg^h-en-*, however, as we might then have expected ***mosg^h-no-*. Pronk (2015) has argued that there was a productive pattern in Indo-European of deriving singulative *n*-stems from body-parts, e.g., *h₃ek^w-n-* ‘one eye’ << **h₃ek^w-ih₁* du. ‘eyes’. Following a suggestion by Lubotsky, Pronk (2015: 341, fn. 52) notes that Skt. *majjān-* is often used “in the plural with the meaning ‘marrow of one bone’”, indicating that the *n*-stem is indeed a derivative from the *o*-stem, which may be regarded as a possible shared Indo-Slavic innovation.

¹⁰² Some Iranian forms seem to reflect **meik/g-*, e.g., MiP Man. ‘myxs’ ‘to be mixed’ and Parth. ‘myj-’ ‘to mix’. The apparent depalatalization could possibly originate in a lost Iranian reflex of **mik-ro-*, but as such a form is not continued, this is difficult to substantiate. See Korn (2010) for an alternative explanation of the Parthian forms.

¹⁰³ Khot. *mijśaā-* ‘marrow’ has been interpreted as an Indo-Aryan loanword (Dragoni 2023: 158, fn. 322).

¹⁰⁴ Lith. *māzgas* ‘knot’ has been connected, but it is probably unrelated and may instead be compared to PGm. **maska-* ‘mesh’ (IEW: 746; Derksen 2015: 308).

Next to PIE **mosgh-o-* ‘brain, marrow’, we may reconstruct **mre/og^h-mn-* ‘brain, skull’, reflected in PGm. **bragna-* ‘brain’ and Gr. βρεχμός m. ‘front part of the head’. Lubotsky (2021) has suggested that the latter stem has been preserved in the compound Skt. *mastghan-* m. ‘brain’ (KauśS) ~ YAv. *mastarəyan-* m. ‘brain’ < **mast-(m)rg^han-*. The first part of the compound may be identified with Skt. *mastīška-* m./n. ‘brain’ (RV+), *mastaka-* m./n. ‘skull, head’ (GrSū.+) ~ Khot. *māstai* ‘brains, head’, which has a plausible cognate in ToA *māśśunt* ‘marrow’ < **mesti-uent-*. Based on its attestation in only Indo-Iranian and Tocharian, it is unclear whether **mesti-* should also be reconstructed for Proto-Indo-European. In any case, the compound **mast-(m)rg^han-* is likely an Indo-Iranian innovation, whereas **mosgh-en-* is shared by Indo-Iranian and Balto-Slavic.

3.3.36. **ne* ‘as, like’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Semantics

Indo-Aryan: Skt. *ná* ‘as, like’

Iranian: YAv. *yaθ-na* ‘namely’ (lit. ‘like which’)

Baltic: Lith. *nè* ‘than; like’, *negù* ‘than’, *nei* ‘than, as if’; Latv. *ne* ‘than’

Slavic: OCS *neže* ‘than’; Ru. *ne* ‘as, like’; Ukr. *niž* ‘than’; Pol. *niż* ‘than’; Cz. *než* ‘than’; SCr. *neže* ‘than’

Indo-Iranian and Balto-Slavic share a particle/conjunction **ne* ‘as, like’, which is generally explained as being etymologically identical to the Indo-European negation **ne* (EWAia II: 2; LEW: 489; Derksen 2008: 352; 2015: 331; Smoczyński 2018: 850–51; *pace* Vasmer II: 204).

Within Indo-Iranian, **na* ‘as, like’ is mostly attested in Sanskrit, although YAv. *yaθna* ‘namely’ may reflect a fossilized remnant of the particle in Iranian.¹⁰⁵ Sanskrit *ná* ‘as, like’ is often, but not always, enclitic. Based on a metrical analysis of the Rigvedic material, Vine (1978: 183) showed that the enclitic position is secondary. This implies that the original syntax is the same as in Balto-Slavic (see below). Furthermore, Vine (1978) argues that *ná* ‘as, like’ originates in negated constructions of the type *ná yám járanti śarádo ná māsā* ‘whom neither years nor months make old’ (RV VI.24.7a). Since *ná* ‘not’ is a verbal negation and not a conjunction, a literal translation would be ‘whom years do not make old, (just like) months do not’. In this way, it is understandable how *ná* ‘not’ could be reanalysed as ‘as, like’. Vine’s explanation provides a plausible alternative to the traditional view (e.g., Whitney 1879: 366) that *ná* ‘as, like’ developed from constructions like *gauró ná tṛṣitáh piba* ‘drink like a thirsty buffalo’ << ‘drink [although, to be sure] not [precisely like] a thirsty buffalo’ vel sim. (RV I.16.5c).

In Balto-Slavic, the relevant particles can be grouped into several categories, since some have been extended with suffixes or are otherwise divergent. Lith. *nè*, *negù* ‘than’ and Latv. *ne* ‘than’ are used after comparatives. This function could be a secondary extension of

¹⁰⁵ For a different view on the Iranian material, in which the particle **na* is connected to a pronominal stem **ana-*, see ESIJ V: 405–8.

Lith. *nè* ‘like’,¹⁰⁶ but may rather have developed independently from the negation **ne* ‘not’.¹⁰⁷ The Baltic comparative particles are comparable to Church Slavic, Czech and Serbo-Croatian particles reflecting PSl. **neže* ‘than’ (*ne* + emph.ptcl. *že*). Similarly, Ukr. *niž* ‘than’ and Pol. *niż* ‘than’ derive from PSl. **ni že*, which probably originally meant ‘nor’, cf. OCS *ni že* ‘nor’ and fn. 107. Closest to Lith. *nè* ‘like’ is Ru. *ne* ‘as, like’, which is attested in Russian *byliny* (archaic epic poetry). This **ne* ‘as, like’ looks archaic within Balto-Slavic and may thus be compared directly to Indo-Iranian **na* ‘as, like’. Finally, Lith. *nei* ‘than; as if’ has both functions and derives (with unclear acute) from Lith. *neĩ* ‘not even’ < PBSl. **nei*. This extended variant of **ne* ‘not’ is old (cf. Lat. *nī*, Goth. *nei*, Av. *nōiŋ*).

In sum, it seems possible that the development of **ne* ‘as, like’ from **ne* ‘not’ was a shared Indo-Slavic innovation, whereas the various particles meaning ‘than’ in Balto-Slavic are independent innovations.

3.3.37. **ni-h₃(e)k^w*- adj. ‘facing downwards’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *nyāñc*- adj. ‘facing downwards’, *nīcā* adv. ‘downwards’, *nyāk* adv. ‘down, downwards’

Iranian: YAv. *niiāñc*- adj. ‘going away, facing away’

Baltic: Latv. *nīca* f. ‘place downstream’, *nīcām* adv. ‘downstream’

Slavic: OCS *nicъ* adj. ‘facing downwards’; Cz. *nicí* adj. ‘facing downwards’; Bulg. *nícom* adv. ‘face down’

Meillet (1926: 172) took the corresponding Slavic and Sanskrit adjectives as an isogloss, to which we may add additional comparanda from Baltic and Iranian. The adjectives Skt. *nyāñc*- and YAv. *niiāñc*- have secondary *-n-*, which is common in compounds with **h₃ek^w*- ‘eye’ (see below). In Sanskrit, case forms of an originally athematic paradigm are preserved as adverbs, e.g., instr.sg. *nīcā* (cf. EWAia II: 60; AirWb.: 1095). Based on the palatalization in Slavic, an *o*-stem may be reconstructed (Derksen 2008: 352–53), which could have replaced an earlier athematic inflection.

OE *nihol*, *nīowol* ‘lying face down’ has traditionally been connected to the Indo-Iranian and Balto-Slavic material (LEW: 503; KEWA II: 182). This etymology is doubtful, however, since the Old English forms reflect a short **i* (Schaffner 1996: 132). To maintain the connection, one would have to assume that an original long **ī* was shortened by analogy to **ni-pera-*. Schaffner (1996: 159) proposes a different analysis, deriving *nihol* from **ni-kuo-lo-* from **ni-kuo-* ‘below, facing down’, cf. Skt. *vísva-* ‘all’. The stem **ni-kuo-* would also be reflected in the first part of the compound OE *niweseoða* ‘lower part of the belly’.

¹⁰⁶ For the semantics, see LKŽ s.v. *ne*³.

¹⁰⁷ Cf. English dialectal *nor* ‘than’, e.g., *There wusnae less nor twenty horses* ‘there were no fewer than twenty horses’ (Wright & Wright 1898: s.v. *nor*)

Arm. *nk^{ctem}* ‘to starve, faint from hunger’ has been derived from **ni-h₃k^w*- ‘downwards’, but Martirosyan’s etymology (2010: 512), deriving it from **ni-* + **kt-* ‘to faint’ is semantically much more straightforward. Thus, it appears that **ni-h₃(e)k^w*- is indeed exclusively Indo-Slavic.

Compounds of adverb + **h₃k^w*- ‘eye’ seem to have been productive in early Indo-European, cf. Skt. *pratīka*- n. ‘surface, face, image’, *pratyāñc*- ‘facing’,¹⁰⁸ Gr. πρόσωπον n. ‘face, countenance, mask, role, person’, ToB *pratsāko* f. ‘breast’ < **proti-h₃k^w*-; Lat. *antīquus* ‘lying in front’ < **h₂enti-h₃k^w*-; Skt. *abhīka*- n. ‘nearness’ < **h₂nb^{hi}-h₃k^w*-; Skt. *āpāñc*- ‘located behind’, PGM. **abuha*- ‘turned the wrong way’, OCS *opaky* ‘the other way round’ < **h₂epo-h₃k^w*-; Skt. *ānīka*- n. ‘face, appearance; front, row, array’, Gr. ἐνώπα ‘in the face’, OIr. *enech* n. ‘face’ < **h₁eni-h₃k^w*-; Lat. *ferōx* ‘fierce, arrogant’ < **fēro-h₃k^w*- ‘having a fierce aspect’. Given the many parallel formations, some in several branches, but others clearly formed within branches, **ni-h₃(e)k^w*- ‘facing downwards’ is a possible shared innovation, but it is difficult to exclude an archaism or independent innovation.

3.3.38. **nog^w-o-* ‘naked’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *nāgá*- m. ‘elephant (AB+); snake (SB+)’

Iranian: –

Baltic: Lith. *nuogas* adj. ‘naked’; Latv. *nuōgs* adj. ‘naked, poor’

Slavic: OCS *nagъ* adj. ‘naked’; Ru. *nagój*, *nag* adj. ‘naked’; Pol. *nagi* adj. ‘naked’; SCr. *nâg* adj. ‘naked’

Arntz (1933: 51) listed this *o*-stem as an Indo-Slavic isogloss. Two questions regarding this etymology must be addressed: the semantics of Skt. *nāgá*- ‘snake; elephant’ and the relationship between **nog^w-o-* and the more widely attested **nog^w-no-* ‘naked’.

Mayrhofer (EWAia II: 33) dismisses the old idea that *nāgá*- ‘elephant’ is extracted from an unattested compound **nāga-hasta*- lit. ‘having a snake-hand’. Instead, both ‘snake’ and ‘elephant’ seem old, which suggests an original meaning ‘bare, naked (animal)’. This makes the connection to Balto-Slavic semantically plausible.

A root **neg^w*- is well attested in Indo-European words for ‘naked’, but several different formations exist (cf. Beekes 1994). Skt. *nagná*- ‘naked’ and YAv. *maṇna*- ‘naked’ (with dissimilation) reflect **ne/og^w-no-*, as well as probably Gr. γυμνός ‘naked, unarmed’, OPr. *nognan* ‘leather’ (EV), and possibly Hitt. *nekumant*- ‘naked’ (if dissimilated from **neg^w-no-nt*- Kloekhorst 2008: 603).¹⁰⁹ Arm. *merk* ‘naked’ reflects an *e*-grade and *r*-suffix, which together with **ne/og^w-no-* could point to an original heteroclitc. Latin and Germanic show forms with an unclear dental suffix **-o/e/ud^h-*, cf. Lat. *nūdus* ‘naked’, Goth. *naqaþs*

¹⁰⁸ The Iranian counterpart YAv. *paitiānc*- ‘turned against’ contains **pati-*, which replaced **prati* ‘against’ in Iranian, showing that compounds with **h₃ek^w*- remained productive into post-Proto-Indo-Iranian times.

¹⁰⁹ ON *nakinn* ‘naked’ is secondary and cannot reflect old **nog^w-no-*.

‘naked’, ON *nøkkviðr* ‘naked’, OSw. *nakuþer* ‘naked’.¹¹⁰ OIr. *nocht* ‘naked’ reflects **nog^w-to-*, likely a Celtic innovation. Based on this material, it is unclear whether a single Proto-Indo-Anatolian form can be reconstructed, although **ne/og^w-no-* seems like the best candidate.

Since both **ne/og^w-no-* and **nog^w-o-* are attested in Indo-Iranian, the latter did not simply replace an older formation, as appears to be the case in Balto-Slavic. Therefore, if **nog^w-o-* is an Indo-Slavic innovation, it may have originated as a dissimilated variant of **ne/og^w-no-*, possibly motivated by taboo reasons or in order to denote some other semantic nuance of ‘naked’, e.g., ‘lacking clothes’ vs. ‘lacking hair’.¹¹¹

3.3.39. **peh₂gs-ó-* ‘(body part) having a side’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *pakṣá-* m. ‘wing (RV); wing of a building (AV)’, *upa-pakṣá-* m. ‘armpit’

Iranian: Oss. *faxs* ‘side, slope of a mountain’¹¹²

Baltic: –

Slavic: Ru. *pax* m. ‘groin’, *paxá* f. ‘armpit’; Cz. m. *pach* ‘groin’, Pol. *pacha* f. ‘armpit’

Arntz (1933: 38, 41) listed Skt. *pakṣá-* next to Ru. *pax*, reconstructable as **peh₂gs-ó-*, as an Indo-Slavic isogloss.¹¹³ As will be argued below, **peh₂gs-ó-* derives from an *s*-stem **peh₂g-os-* reflected by Skt. *pájas-* ‘(front) side; firmament; face’.

The *s*-stem **peh₂g-os-* can be connected to **peh₂g-* ‘to become firm’, continued in Skt. 3sg.int.med. *pāpaje* ‘stays behind’, Gr. *πῆγνυμι* ‘to fix, stick’ etc., which suggests an original meaning ‘support’, ‘that which is (or makes) firm’. This is reflected in Skt. *pájas-* n. ‘firmament’, i.e., ‘the surface to which the sky is attached’. Skt. *pájas-* also means ‘front side’, e.g., the front side of a chariot, as well as ‘face’, as in the front side of a person (or deity). Furthermore, it means ‘side, flank’, often of the body. The Iranian cognates show a comparable semantic range, with Khot. *pāysa-* ‘breast’ and Sogd. C *p’z* ‘face’ etc. reflecting the ‘front side’ meaning, while Oss. I *faz* / D *fazæ* also means ‘side, half, anus’.¹¹⁴ Slavic does not preserve an *s*-stem, but has an *o*-stem in ORu. *pazъ* m. ‘joint, groove’, Sln. *pâz* m. ‘joint’ from the same root.

Skt. *pakṣá-* ‘wing’ may be explained as a possessive thematic derivative from *pájas-* ‘(front) side; firmament; face’. The derivation is likely old, for several reasons: first, it presupposes loss of the laryngeal in preconsonantal position, which is a Proto-Indo-Iranian development (Lubotsky 1981). This fits with the meaning of *pakṣá-* ‘wing’, which does not point to a synchronic derivation from *pájas-*. Additionally, Oss. *faxs* ‘side, slope of a

¹¹⁰ Pace Schrijver (1991: 274–75), not all Germanic forms can be explained from a suffix form **-od^h-*.

¹¹¹ Cf. Sw. *naken* ‘naked (in general, of parts of the body, metaphorically)’ vs. *näck* ‘lacking any clothes on the body’.

¹¹² For further possible cognates in Iranian, reflecting Plr. **paxša-* ‘mosquito’, see ESIJ VI: 109–10.

¹¹³ Arntz also adduced Latv. *paksis* ‘corner of a house’, which is formally impossible.

¹¹⁴ The meaning of the hapax YAv. *pāzaṇ^hant-* ‘(broad-)breasted (?)’ is uncertain, but it shows that the *s*-stem is old in Indo-Iranian. Further cognates include Khwar. *p’z* ‘breast’, Shu. *puz* ‘breast’ and Wakh. *pyz* ‘breast’.

mountain', which can hardly be separated from Skt. *pakṣá-*,¹¹⁵ is incompatible with a palatal **ǵ*, and rather points to PIr. **-kš-* (e.g., Oss. I *æxsæv* / D *æxsævæ* 'night' < **kšapā-*). This suggests that **ǵ* underwent depalatalization in the heavy cluster that arose when **peh₂gs-ó-* was derived from **peh₂ǵ-os-*.

Although requiring an extra assumption, this scenario is attractive, because it also explains Ru. *pax* 'groin', *paxá* 'armpit' etc., which cannot have been derived within Slavic from, e.g., ORu. *pazъ* m. 'joint, groove' (nor from an unattested *s*-stem **pazo*), but nevertheless clearly belong here semantically. In this way, Sanskrit 'wing' and Slavic 'groin, armpit' developed from **peh₂gs-ó-* '(body part) having a side' << **peh₂ǵ-os-* 'side (that supports)'. The semantic closeness is further highlighted by Skt. *upa-pakṣá-* m. 'armpit'. This derivative is a possible Indo-Slavic shared innovation, although it cannot be excluded that the stem was lost in other branches.

3.3.40. **peh₃i-men-* 'milk'

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: –

Iranian: YAv. *paēman-* n. 'mother's milk'; MiP Pahl. *pēm* 'milk'; MoP *pīnu* 'sour milk, cream cheese, buttermilk'; Sogd. C *rxpyn* 'whey, new cheese (?)' < **huxra-paina-*

Baltic: Lith. *píenas* m. 'milk'; Latv. *piēns* m. 'milk'

Slavic: –

Arntz (1933: 56) considered the Persian and Lithuanian words for 'milk', both having lost the **-m-* of the related form YAv. *paēman-* 'mother's milk', to be an Indo-Slavic isogloss. An Iranian stem **paina-* is further reflected in Sogd. C *rxpyn* 'whey, new cheese (?)' < **huxra-paina-* (see p. 85). In (Core) Proto-Indo-European, the suffix **-mn-* was reduced to **-m-* in the oblique stem of roots containing a labial consonant (cf. AiGr. II, 2: 766; Kroonen 2006). This process explains the *no*-stems of Baltic and Iranian as thematicized variants of **peh₃i-men-*. The fact that this cluster reduction was a Proto-Indo-European phenomenon does not necessarily imply that **peh₃i-men-* is a shared archaism, since the process may well have been productive in Indo-Slavic.

As for potential extra-Indo-Slavic cognates, ON *feima* f. 'shy girl' and OE *fæmne*, *fémne* f. 'virgin, damsel, maid, woman' have been derived from **peh₃i-m(e)n-ieh₂-* lit. 'nursing woman' (cf. de Vries 1977: 115). Semantically, this etymology is not obvious, since a 'virgin' is specifically *not* a 'nursing woman'. A more plausible preform is **poh₂i-m(e)n-ieh₂-* 'shepherdess'.

The stem **peh₃i-men-* 'milk' is generally derived from **peh₃(i)-* 'to drink'. The *i*-extension appears in certain verbal derivatives of the root, e.g., Gr. imp. *πιθι* 'drink!', Skt. *pāyáyati* 'to let drink', OCS *piti*, *pijō* 'to drink', and perhaps Alb. *pi* 'to drink'. From such

¹¹⁵ Based on its semantics, Oss. *faxs* 'side, slope of a mountain' is perhaps better compared with Skt. *pákṣas-* n. 'side' (Cheung 2002: 182), which is a secondary *s*-stem derived from *pakṣá-* 'wing'. In any case, the Ossetic form shows that the cluster must have been PIr. **-kš-* rather than **-ǵš-*.

verbal forms (an *i*-perfect with a dative subject is preserved in Skt. *pīpāya* ‘swells up (with milk)’ according to Lubotsky 2011: 121), a secondary root **peh3i-* ‘to swell (with milk), nurse’ was lexicalized, which was the basis for **peh3i-men-* ‘milk’. This stem is a possible Indo-Slavic innovation.¹¹⁶

3.3.41. **pelH-ou-* ‘chaff’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Semantics

Indo-Aryan: Skt. *palāva-* m. ‘chaff, husks’

Iranian: –

Baltic: Lith. *pēlūs* m.pl. ‘chaff’; Latv. *pēlus* f.pl. ‘chaff’; OPr. *pelwo* ‘chaff’ (EV)

Slavic: OCS *plěvy* f.pl. ‘chaff’; Ru. *polóva* f. ‘chaff’; SCr. *pljěva* f. ‘chaff’

Based on the Sanskrit and Balto-Slavic words for ‘chaff’, together with Lat. *pulvis* n. ‘dust’, an amphidynamic *u*-stem **pelH-ou-* may be reconstructed (IEW: 802; de Vaan 2008: 440; Smoczyński 2018: 940). Gr. *παλύνω* ‘to strew, sprinkle’ is possibly denominative from an unattested reflex of **plH-u-* ‘sprinkle (?)’, a stem variant of **pelH-ou-*.¹¹⁷ While the stem itself is not an isogloss, the meaning ‘chaff’ is restricted to Indo-Iranian and Balto-Slavic and reflects a possible shared semantic innovation.

Other formations from the same root also show a distribution between agricultural and non-agricultural meanings (see IEW: 802). ON *fōl* n. ‘thin layer of snow’, Far. *fōlva* ‘to cover in a thin layer (of snow, butter, flour)’ and Alb. *pall* m. ‘finely milled flour, chaff and dust from harvested grain’ reflect **polH-uo-*. Here, the connotation to agricultural products may be an Albanian innovation. It is of course difficult to exclude that the agricultural meaning is original in both **pelH-ou-* and **polH-uo-*.

3.3.42. **seng-* ‘to attach, fasten’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Root

Indo-Aryan: Skt. 1sg.pres.act. *á sajamī* ‘I fasten, attach’, 3sg.aor.med. *ní asakta* ‘he has hanged (smth.) down at himself’ (RV+), 3sg.pf. *sasañja* (Br.)

Iranian: OP 1sg.imf.act. *frāha⁽ⁿ⁾jam* ‘I hung out’; MiP Man. ‘šynz- ‘to draw up’; MoP *āvang(ān)* ‘hanging’; Yi. *awāž-* ‘to hang up’

Baltic: Lith. *sėgti, sėga* ‘to fasten, pin, tack, attach’; Latv. *segt, sēdzu* ‘to cover, fasten’

Slavic: CS *prisěgnŏti* ‘to touch’; Ru. *sjagnút* ‘to reach for, attain’; Pol. *sięgać, sięgam, sięgnąć, sięgnę* ‘to reach for, reach’; SCr. *sězati, sěžem* ‘to reach, attain’, *sěgnuti* ‘to reach’

¹¹⁶ Lith. *pajai* ‘beeswax’ has been connected to **peh3i-* ‘to swell up’ (LEW: 527) and compared to YAv. *paēnaēna-* ‘made of honey’, Orm. *pīn* ‘honey’, Sogd. B *’nkwypyn* ‘honey’, Psht. *gabína* ‘honey’ < **hangu-paina-* ‘honey’ (cf. Morgenstierne et al. 2003). While the semantic connection is interesting, there is no formal correspondence and the semantic shift in Iranian is explained by the compound **hangu-paina-* lit. ‘bee’s milk’.

¹¹⁷ Alternatively, Gr. *παλύνω* may be derived from *πάλη* f. ‘flour’.

A root **se(n)g-* ‘to attach, fasten’ has been reconstructed based on the above verbal forms as well as nominal forms in other branches, viz. MIr. *sén* ‘(bird) trap’ < PCelt. **segno-*, MWelsh *hoenyn*, *hwynyn* m. ‘net, trap’ < PCelt. **sogno-*, and MHG *senkel* m. ‘shoelace, string; anchor, fishing net weighed down with lead balls’ (IEW: 887–88).

There is a discussion in the literature whether the root was **seg-* or **seng-*. The abovementioned Celtic forms point to **seg-*, but it should be noted that these etymologies are rather uncertain, both in terms of semantics and form.¹¹⁸ The meaning ‘shoelace, string’ of MHG *senkel* is secondary in view of OHG *sinkel* m., which only means ‘anchor, fishing net weighed down with lead balls’ and is no doubt deverbal from *senken* ‘to sink’ (EWD s.v. *Senkel*).

As for the Indo-Iranian verbal forms, LIV: 516 follows Klingenschmitt (1982: 185 fn. 26) in taking the forms with *-n-* in the root as secondary. It is argued that they may be analogical, since they are not attested in RV. However, this claim does not take into account the Iranian forms pointing to **seng-*, viz. MiP Man. *’šynz-* ‘to draw up’ and MoP *āvang(ān)* ‘hanging’.¹¹⁹ In view of the Iranian evidence, **sanǵ-* should be reconstructed for Proto-Indo-Iranian, while the forms without nasal in Sanskrit reflect the zero-grade **saǵ-* < **snǵ-*.

Baltic does not reflect a nasal in the root, but neither can the attested forms be derived regularly from **seg-*, since the root does not show the effect of Winter’s Law. According to Kortlandt (1988: 389), the Baltic root was back-formed from a nasal stem **seng-n-*, cf. CS *-seǵnǫti* ‘to touch’, where Winter’s Law was blocked. The regular acute is reflected by, e.g., SCr. *sězati* ‘to reach, attain’.

Thus, the likeliest reconstruction for both Indo-Iranian and Balto-Slavic is **seng-*, which constitutes an Indo-Slavic root isogloss. This may most plausibly be analysed as an archaism, although an innovation cannot in principle be excluded.

¹¹⁸ Lat. *sagum* n. ‘woollen cloak’ is unrelated (cf. de Vaan 2008: 534). As for the Celtic forms, the semantic connection is possible but not compelling. The difference in root ablaut in Irish and Welsh is unexplained.

¹¹⁹ Khwar. *mǵšnc-* ‘to sit on (horse), ride’ may also belong here. The meaning ‘to sit on (horse), ride’ may have developed from ‘to hang (reins) around, fasten (reins) around (a horse), especially in view of RV I.33.3a *ní sárvasenaḥ iṣudhín asakta* ‘fully armed, he has laden himself down with quivers’ (translation by Jamison & Brereton 2014: 137), referring to Indra hanging quivers around his neck.

3.3.43. **seuk-* ‘to turn, twist; to churn’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Root Semantics

Indo-Aryan: –

Iranian: MoP *ruxbīn* / *rixbīn* ‘sour milk, new cheese’;¹²⁰ Sogd. C *rxpyn* ‘whey, new cheese (?)’; Oss. I *x_oyrx* / D *xurxæ* ‘whey’

Baltic: Lith. *sùkti* ‘to turn, twist; to spin (yarn), twist (strands of rope); to churn (butter)’, *pāšukos* f.pl. ‘buttermilk’, *iššukos* f.pl. ‘buttermilk’, *sùkras* adj. ‘agile, diligent, swift’, *sukrūs* adj. ‘tightly twisted, winding, vigorous; quick, agile’; Latv. *sukrs* adj. ‘strong, energetic, swift’

Slavic: (CS *sukati* ‘to turn’; Ru. *sukátʹ* ‘to turn, twist’; OPol. *sukać* ‘to twist threads together’)

The comparison of the Ossetic and Baltic words goes back to Lidén (1933: 7). He argued that a root **seuk-* ‘to turn’ is uniquely attested in Balto-Slavic and Iranian (Ossetic), which in both branches denotes curdling of milk. Moreover, Lidén noted the formal correspondence between Oss. I *x_oyrx* / D *xurxæ* ‘whey’ < **sukrā*–¹²¹ and Lith. *sùkras* ‘agile, diligent, swift’.

We may now add Sogdian and Persian comparanda, reflecting a compound **sukra-paina-* ‘whey, sour milk, new cheese’ as additional evidence for Iranian **sukra-*. A possible interpretation is that **sukra-paina-* contains an adjective **sukra-* ‘turned, twisted’ rather than the nominalized **sukrā-* ‘whey’ reflected in Ossetic. If correct, Iranian **sukrā-* may be compared to Lith. *sùkras*, *sukrūs* and Latv. *sukrs*. Within Indo-Iranian, **sukrā-* and its semantic connection to dairy products must be an archaism, as the root is not attested elsewhere.

The Baltic *ro*-adjective is connected to Lith. *sùkti* ‘to turn, twist; to spin (yarn), twist (strands of rope); to churn (butter)’, which itself has retained the original meaning of the root, cf. CS *sukati* ‘to turn’ etc., as well as several specialized meanings including ‘to churn’. Among its many nominal derivatives, those that relate to milk are *pāšukos* ‘buttermilk’ and *iššukos* ‘grease from the axle of a wheel; dust off a grinding wheel; buttermilk’ (cf. LEW: 548; Smoczyński 2018: 1324).¹²²

As for the semantics of **seuk-*, it must be noted that it refers to ‘buttermilk’ in Baltic, whereas Iranian **sukrā-* mainly refers to ‘whey’ or ‘cheese’. However, we also find

¹²⁰ Psht. *raxpīn/η* m. ‘dried solids of buttermilk’, *xarpīn* m. ‘whey’ may be borrowings from Persian (Morgenstierne et al. 2003 s.vv.).

¹²¹ Cheung (2002: 251) alternatively reconstructs **surakā-* and connects the Ossetic word to YAv. *hurā-* f. ‘an alcoholic drink, kumis’, which requires the assumption that final -x is the result of assimilation.

¹²² Lith. *sunkà* ‘juice; soup liquid; decoction; bodily fluids; whey’ and Latv. *sūkalas* f.pl. ‘whey’ (cf. *sūkala* f. ‘drop’) are rather from Lith. *suñktis* ‘to trickle out slowly (of resin, whey, sweat, blood, tears)’, *suñkti* ‘to sip, strain through a strainer, press out juice’, Latv. *sūkt* ‘to suck (of a leech); to strain through a strainer’, related to Lat. *sūcus* m. ‘juice’, ON *súga* ‘to suck’ etc.

a connection to ‘buttermilk’ in Psht. *raxpín/n* m. ‘dried solids of buttermilk’, which indicates that the semantic difference from Baltic is trivial.

Thus, it is possible that the development ‘to turn’ >> ‘to churn’ was a shared Indo-Slavic change. The possibly shared formation **suk-ro-* ‘turned, twisted’ favours this conclusion.

3.3.44. **som-d^heh₁-* ‘agreement’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	Semantics

Indo-Aryan: Skt. *saṃdhā́* f. ‘agreement, promise’ (AV+)

Iranian: –

Baltic: Lith. *samdà* f., *saṃdas* m. ‘rent, hire, hired workers, servants, family’

Slavic: OCS *sqdъ* m. ‘court of law, trial, verdict, judgement’

Meillet (1926: 169) takes the formal and semantic correspondence between Skt. *saṃdhā́*- (EWAia I: 784) and Lith. *samdà* as an Indo-Slavic isogloss. YAv. *haṇ-dāiti*- f. ‘collection’ has a different suffix, **-ti-*, and in view of its productive semantics, it is derived within Iranian (cf. Gr. σύνθεσις f. ‘putting together; agreement). Lithuanian also has a variant *saṃdas*, which is attested earlier than *samdà* and is inflected as an *o*-stem, corresponding to OCS *sqdъ* (LEW: 761; Derksen 2008: 463; 2015: 389). Consequently, **som-d^hh₁-o-* is the most likely Proto-Balto-Slavic reconstruction.

If PBSl. **som-d^hh₁-o-* is to be compared with Skt. *saṃdhā́*-, the latter being a compounded root noun (AiGr. II, 2: 15), one would have to assume that the *o*-stem is secondary. Such an assumption is complicated by Lithuanian compounds like *avidė* ‘sheepfold’, *alūdė* ‘beer keg’, which have been argued to reflect an old root noun **d^heh₁-* (LEW: 92). However, these compounds can just as well be analysed as derivatives in *-ė*, in view of the non-acute intonation.¹²³ Moreover, the retained nasal in compounds with *-das* in Lithuanian, e.g., *saṃdas*, *iṇdas*, *indà* ‘container, pot’, implies that they are archaic (contra *sq̇-* ‘together, with’, *ĩ-* ‘in’). In addition, the lexicalized semantics of both Lith. *saṃdas* and OCS *sqdъ* indicate an archaic derivation, as they do not look deverbal. It therefore seems not at all impossible that PBSl. **som-d^hh₁-o-* is a thematicized root noun. The original meaning may have been ‘agreement, conclusion (of business)’ vel sim., which was further specified to an economic context in Baltic and a judicial context in Slavic.

Skt. *saṃdhā́*- ‘agreement, promise’ is also further lexicalized, i.e., further removed from the literal meaning of the root, when compared to other derivatives like *saṃdhí-* m. ‘joint, juncture’ (RV) (<< ‘putting together’) or *durdhā́*- f. ‘disarrangement’ (RV) (<<

¹²³ According to Kortlandt (1985: 120), the circumflex *-ẽ* in Lith. *avidė* ‘sheepfold’ etc. is due to regular loss of laryngeals after **ē* in root nouns. However, even if the circumflex nominative in Lithuanian *ẽ*-stems is explained in this way, it does not prove that *avidė* ‘sheepfold’ etc. reflect old root nouns, since *ẽ*-stems became productive in Baltic. The transparent semantics of *avidė* ‘sheepfold’ and *alūdė* ‘beer keg’, i.e., ‘where sheep/beer is put’, derivable from the verb *dėti* ‘to put, place’, are also compatible with a later derivative. In the case of *alūdė*, the first member *alū-* is probably a Germanic borrowing, and so this particular case cannot be of Proto-Balto-Slavic age.

‘what is badly put’). In RV, *sám-* + *dhā-* generally means literally ‘to put together’.¹²⁴ This suggests that *saṃdhā-* ‘agreement, promise’ is not a recent deverbal stem, but rather an inherited formation.

In conclusion, **som-d^heh₁-* ‘agreement’ may be analysed as an Indo-Slavic semantic isogloss, since the stem formation of the attested forms is not fully comparable. Naturally, it is difficult to rule out the possibility of independent innovation, but the fact that the preverb **som-* ‘together’ is only used in Indo-Iranian and Balto-Slavic lends support to a shared innovation.

3.3.45. **suleh₂-* ‘juice; milk’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *sūrā-* f. ‘an alcoholic drink’

Iranian: YAv. *hurā-* f. ‘an alcoholic drink, kumis’; MiP Pahl. *hur* ‘an alcoholic drink’; Khot. *hurā-* f. ‘fermented mare’s milk’

Baltic: Lith. *sulà* f. ‘birch or maple juice’; Latv. *sula* f. ‘tree sap; gastric juice’; OPr. *sulo* ‘curdled milk’ (EV)

Slavic: –

Arntz (1933: 53) listed this as an Indo-Slavic isogloss. Goth. **bi-sauljan* ‘to make spotted, unclean’, Nw. (dial.) *saula* f. ‘dirt’, OHG *sol* m. ‘mud-puddle’ have been connected (cf. Lehmann 1986: 72), but the semantics are not very close to the Indo-Iranian and Baltic words. Gr. *ῥα* f. ‘mud’ has been seen as a reflex of **suleh₂-* (LEW: 940). However, according to Beekes (2010: 1530), this is merely a chance resemblance and the meaning ‘mud’ is secondary from *ῥα* f. ‘stuff, matter’.

While the Indo-Iranian (EWAia II: 737; AirWb.: 1837) and Baltic (LEW: 940) forms match formally, the semantics are divergent. In Iranian, the reflexes of **suleh₂-* denote a specific type of fermented mare’s milk (kumis), which is common on the Eurasian steppe. Evidence for the consumption of mare’s milk goes back to the Early Bronze Age in the Pontic-Caspian steppe (Wilkin et al. 2021). The exact meaning of Sanskrit *sūrā-* is debated. It is possible that it originally meant ‘kumis’ but came to signify another type of alcoholic drink when the speakers of Indo-Aryan migrated away from the steppe. OPr. *sulo* ‘curdled milk’ is semantically quite close to Iranian. On the other hand, the East Baltic

¹²⁴ Grassmann (1996: 663ff) glosses two attestations of *sám-* + *dhā-* as ‘(einen Bund) schliessen’, i.e., ‘to form (an alliance)’:

RV VIII.67.21ab: *ví sú dvéšo vy àṃhatīm ádityāso ví sámhitam*

‘O Adityas, rip apart hostility, apart constraint, apart what is packed together’ (Jamison & Brereton 2014: 1157).

RV X.100.4bc: *rājā sómah suvitásyādhy etu naḥ yáthā-yathā mitrádhitāni saṃdadhúr*

‘Let King Soma stay mindful of our welfare, in the same way that (pacts) concluded by allies bind (them [=allies]) together’ (Jamison & Brereton 2014: 1559).

As the translations show, *sám-* + *dhā-* can in both cases be read as ‘to put together’, rather than ‘to form an alliance’.

forms generally do not refer to milk.¹²⁵ However, the Prussian-Iranian correspondence suggests that Indo-Slavic **suleh₂-* could denote a dairy product, although this may not have been the only meaning of the stem (a possible root cognate with similar semantics is Mlr. *suth* m. ‘milk’ < **su-to-*).¹²⁶

The stem **suleh₂-* has been seen as a derivative from **seu-* ‘to press’ (IEW: 912–13), whence also Skt. *savá-* m. ‘juice’ and PGm. **sawwa-* n. ‘juice’ (Kroonen 2013: 428). Alternatively, one may assume a derivation from **suel-* ‘to consume’, reflected only in Iranian, e.g., YAv. *x^varaiti* ‘to consume, eat’, Khwar. *x(w)r-* ‘to consume, eat, drink’.¹²⁷ The root etymology of **suleh₂-* cannot be considered certain, but the stem is an Indo-Slavic isogloss and a possible shared innovation.

3.3.46. **tsprh_{2/3}-e/o-* ‘to kick away with the foot’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^v Derivation

Indo-Aryan: Skt. *sphuráti* ‘to push away with the foot’

Iranian: YAv. *fra-spara-* ‘to kick away’; MiP Pahl. *spar-* ‘to trample, tread’; MoP *sipardan* ‘to trample; to be trampled’; Sogd. *C pšpr-* ‘to trample on’; Khot. *vaspuḍai* ‘he trod’; Oss. I *æfsæryn* ‘to press on; to push’ / D *æfsærun* ‘to kick with the feet’; Wakh. *nəsp(ə)r-* ‘to kick (with the feet)’

Baltic: (Lith. *spirti*, *-ia* ‘to kick with a leg or hoof’; Latv. *speŗt*, *speŗu* ‘to kick, strike (of lightning)’)

Slavic: Ru. *perét*, *pru* ‘to brace one’s feet against, push’; Pol. *przeć*, *prę* ‘to stem’; SCr. *zàprijeti*, *zàprêm* ‘to confine, close’

According to LIV: 585, only Indo-Iranian and Slavic attest a thematic present with zero-grade in the root from the root **sp^herH-* ‘to kick away with the foot’. The root is further attested in the Indo-European word for ‘heel’, cf. Skt. *párṣṇi-* f. ‘heel’, Gr. *πέρνη* f. ‘heel’, Lat. *perna* f. ‘leg, haunch’, Goth. *fairzna* f. ‘heel’, Hitt. *paršna* ‘heel (?)’. I follow Lubotsky’s (2006) reconstruction, with the specification of the final laryngeal according to Kloekhorst (2008: 410), i.e., **tsperh_{2/3}-*, which accounts for the initial clusters of the attested forms.

¹²⁵ Latv. *suliņas* ‘whey’ (= ‘milk juice’?) is probably a secondary derivative from *sula*, and does not prove that the latter originally denoted a dairy product in East Baltic.

¹²⁶ If ‘juice, sap’ was part of the original semantic scope of **suleh₂-*, the meaning ‘fermented/curdled milk’ may have developed in a metaphorical sense as the ‘juice from a mare/cow’. A parallel for this is OHG *quiti*, *kuti* m. ‘resin’, Skt. *jātu-* n. ‘varnish, gum’, Welsh *bedw-en* sgl. ‘birch’ < **g^wet-u-*, from which are derived ON *kváða* f. ‘resin’, Nw. *kvåde*, *kode* f. ‘resin; watery fluid from a pregnant cow’s udder; raw milk’, Far. *kváð* n., *kváð(a)* f. ‘viscous fluid from a cow’s teat’ (Hellquist 1922: 382; Kroonen 2013: 315). Arm. *keč*’*i* ‘birch’ and *kir*’** ‘dairy produce’ may be near identical to the formations attested in Germanic (Rasmussen 1999: 622–23; Martirosyan 2010: 359).

¹²⁷ Cf. LIV: 609. Cheung (2007: 147) considers Iranian **huar-* ‘to consume’ to have developed from *huar-* ‘to take’. Alternatively, **huar-* ‘to consume’ derives from **suel-* ‘to swell’, with a semantic change from ‘to swell (with milk)’ >> ‘to (give to) drink’. This would indicate that **suleh₂-* originally referred to milk.

The Indo-Iranian evidence is straightforward (cf. EWAia II: 776). While YAv. *-spara-* could in theory reflect either PIr. **sp^harH-a-* or **sp^hrH-a-*, Skt. *sphurāti* unambiguously points to the latter.

The Slavic material is more complex, since the reflexes of **tsprh_{2/3}-e/o-* ‘to kick away with the foot’ partially overlap with verbal stems from other roots (Vaillant III: 188–89). Derksen (2008: 396) groups Ru. *perét* ‘to brace one’s feet against, push’ together with the homonymous *perét* ‘to go’, connecting them to Lith. *peĩti* ‘to beat’ < **per-* ‘to beat’. It seems more likely (with Vasmer II: 341) that *perét* ‘to go’ belongs with **per-* ‘to go across’, cf. Skt. *pipárti* ‘to bring across’, Goth. *faran* ‘to go’, and that the Slavic correspondence of Lith. *peĩti* ‘to beat’ is OCS *p̃rati*, *perq* ‘to beat, trample, wash’ (due to the practice of washing by lashing with a bath besom). Ru. *perét*, *pru* ‘to brace one’s feet against, push’ < **tsprh_{2/3}-e/o-* then corresponds to Lith. *spĩti*, *-ia* ‘to kick with a leg or hoof’, although the present stem in Lithuanian is secondary (Smoczyński 2018: 1261).¹²⁸

Since other branches reflect a potentially archaic nasal present, cf. Arm. *sparnam* ‘to threaten’, Lat. *spernō* ‘to kick away; to despise’, ON *sperna*, *sporna* ‘to kick, spurn’ < **tspr-n-h_{2/3}-*, Indo-Slavic **tsprh_{2/3}-e/o-* is a potential innovation. It is difficult to exclude that the Slavic form is a late innovation, however, since the stem type may have been productive, cf. OCS *požřeti*, *požbrq* ‘to swallow, devour’ < **g^wrh₃-e/o-*, (see p. 100). Yet, the fact that the present formations **g^wrh₃-e/o-* ‘to devour, swallow’ and **tsprh_{2/3}-e/o-* ‘to kick away with the foot’ are both exclusively shared by Indo-Iranian and Slavic increases the likelihood that this productivity goes back to a shared Indo-Slavic stage.

3.3.47. **tusk-io-* ‘empty’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation Root

Indo-Aryan: Skt. *tucchyá-* adj. ‘empty’

Iranian: MiP Pahl. *tuhīg*, Man. *twhyg* adj. ‘empty, vain’; Khot. *ttušśaa-* adj. ‘empty’; Oss. I *tyssæg* adj. ‘empty’; Psht. *təš* adj. ‘empty’; Wakh. *təš* adj. ‘empty’

Baltic: Lith. *tūščias* adj. ‘empty, hollow, idle, vain’; Latv. *tukšs* adj. ‘empty, poor’

Slavic: OCS *tъštъ* adj. ‘empty’; Ru. *tóščij* adj. ‘gaunt, empty, poor’; Pol. adj. *czczy* ‘empty’; SCr. *tăšt* adj. ‘empty, vain, conceited’

Schmidt (1872: 49), Arntz (1933: 36) and Porzig (1954: 167) present this word as an Indo-Slavic isogloss, but do not comment on the reconstruction. The Indo-Iranian words, which go back to PIr. **tusćia-*, have been analysed as a *io*-derivative from a present stem **tusk-*, cf. YAv. 3pl. *tusən* ‘they lose (temper)’, *taošaieiti* ‘to leave hold of, drop’ (EWAia I: 652). Lubotsky (2001a: 42–43) argues against this etymology, since nominal derivatives are not normally based on present stems, and since YAv. *tusən* need not be old, as *sk*-presents became productive in Iranian. Instead, he analyses PIr. **tusćia-* as deriving from **tusk-o-*

¹²⁸ There is also OCS 3pl. *perq̃bъ* ‘they fly’, which Vasmer connects to Ru. *perét* ‘to go’ (Vasmer II: 341). Perhaps Derksen (2008: 427) is right that it rather belongs with OCS *pero* n. ‘feather’.

‘emptyness’, reflected in ORu. *t̃ska* f. ‘grief, longing’. This reconstruction precludes a root connection to YAv. *taošaieiti*, since a primary *ko*-stem would be as implausible as a deverbal stem **tus-sk-io-*. We are instead forced to assume a new root, **tu(e)sk-*, with final **-k*.

Derksen (2015: 475–76) rejects Lubotsky’s reconstruction, arguing for a preform **tus-sk-tio-*, since the Baltic forms are incompatible with **tusk-io-*. However, Derksen’s reconstruction is problematic on the Indo-Iranian side, since Skt. *tucchyá-* is accented on the suffix, whereas the deadverbial suffix *-tya-* < **-tio-* is unaccented (AiGr. II, 2: 697). A suffix *-čias* becomes productive in Lithuanian, but there is no attested verbal stem from which *tūščias* could have been derived (Lith. *tuštėti* ‘to become empty’ is denominal, cf. LEW: 1146).

More probably, the Baltic words may in fact be derived regularly from **tusk-io-*, assuming a special development of the cluster **-skj-* (cf. Gorbachov 2014). Conversely, Kortlandt (1979) argued that **skj* yielded Slavic **s*, Lith. *š*, Latv. *s* (i.e., PBSl. **š*), but all three alleged examples are problematic. First, Lith. *šauti* ‘to shoot’ and OCS *sovati* ‘to throw’ have been derived from a root **skeu-* > **skiau-*, but more likely reflect **keuH-* (see p. 66), as **eu* > **iau* must postdate the palatalization of **sk-*.¹²⁹ Moreover, the only external evidence for **sk-* was the connection to PGm. **skeutan-* ‘to shoot’, but the etymology has been rejected by Kroonen (2013: 445), who derives the Germanic verb from **sket-*. Second, OCS *senb* f. ‘shadow’ and Latv. *seja* f. ‘face, shadow’ are usually connected to Skt. *chāyā-* f., Gr. *σκιά* f. ‘shadow’ < **sk(o/e)Hi-eh₂-*. However, as both Kortlandt (1979) and Derksen (2015: 549) acknowledge, the anlaut *s-* < **sk-* must be secondary, since the vocalism of the Balto-Slavic forms points to **-e/oi-* rather than **i/j-*. They argue that the *s-* was taken over from the verb (which constitutes the third example of **skj* > **š*), e.g., PSl. **sijàti* ‘to shine’ < **skHi-*, where the palatalization would have been regular. However, it must be noted that in **tusk-io-*, **sk* is in a RUKI position, which is not the case for PSl. **sijàti*. It is not *a priori* certain that **šk* would have the same development as **sk*.

Thus, only one example of the alleged palatalization of **sk* > **š* / *_i* can be maintained, but the phonology of PSl. **sijàti* is not similar enough to Lith. *tūščias* to falsify the derivation of the latter from PBSl. **tušk-io-* < **tusk-io-*. I conclude that **tusk-io-* is an Indo-Slavic isogloss. If **tusk-io-* is a *io*-adjective derived from **tusk-o-*, reflected in ORu. *t̃ska* ‘grief, longing’, it is a possible shared innovation.

¹²⁹ This chronology is required to explain why **r*, **l* > PBSl. **ir*, **il* etc. do not cause palatalization of a preceding **sk* (cf. Kortlandt 1979).

3.3.48. *uert-men- ‘course’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *vārtman-* n. ‘track, course’

Iranian: –

Baltic: –

Slavic: OCS *vrěmę* n. ‘time’; SCr. *vrijème* n. ‘time’

This *men*-stem was listed as an isogloss by Arntz (1933: 53). Although Skt. *vārtman-* (EWAia II: 520) differs slightly from OCS *vrěmę* (Vasmer I: 235; Derksen 2008: 516) semantically, the step from ‘course’ >> ‘time’ is a rather trivial semantic development, implying that the Indo-Aryan and Slavic words may derive from the same *men*-stem.

Verbal forms of *uert- ‘to turn’ retain the basic meaning in Slavic, e.g., OCS *vr̥titi sę* ‘to turn’ (cf. LIV: 691), which contrasts with the lexicalized meaning of PSl. **vermę* ‘time’, indicating that the latter is not a recent deverbal formation. This is consistent with the fact that the suffix *-men- was only marginally productive in Slavic (Matasović 2014: 25). The semantics may not be too informative, however, since similar developments are attested in other nominal derivatives from *uert- ‘to turn’ in Balto-Slavic, e.g., OCS *vr̥sta* f. ‘age, generation’ vs. Ru. *verstá* f. ‘verst (a distance of 1.1 km)’, Lith. *vārsta* m. ‘turn of the plough, verst’. While a shared innovation remains possible, it is difficult to rule out that the reflexes of *uert-men- were derived independently.

3.3.49. *uolk-o- ‘hair’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *vālśa-* m. ‘sprout, twig’

Iranian: YAv. *varəsa-* m. ‘hair (on the head)’; MiP Pahl. *wars* ‘hair’; MoP *gurs* ‘hair’; Sogd. BCS *wrs* ‘hair’; Psht. *wex̌tə*, Wan. *wušt* m. ‘hair’

Baltic: –

Slavic: OCS *vlasъ* m. ‘hair’; Ru. *vólos* m. ‘hair’; Pol. *włos* m. ‘hair’; SCr. *vlâs* m. ‘hair’

Indo-Iranian and Slavic share an *o*-stem from a root *uelk-* (EWAia II: 526–27; AirWb.: 1374; Vasmer I: 221; Derksen 2008: 526–27), taken as an isogloss by Meillet (1926: 173). The meaning of Skt. *vālśa-* m. ‘sprout, twig’ is likely secondary from ‘hair’, cf. Lat. *comātus* ‘rich with foliage’ << *coma arboris* ‘hair of a tree’ (KEWA III: 168).

Several Iranian languages have been argued to show a parallel *o*-stem with zero-grade in the root, viz. YAv. *fr̥ā.vərəsa-* adj. ‘lacking hair’, MoP *gurs* ‘hair’, Psht. *wex̌tə*, Wan. *wušt* m. ‘hair’ < PIr. **uř́ća-*. However, Gershevitch (1959: 265) has provided an alternative explanation for YAv. *fr̥ā.vərəsa-* < **uř́t-sa-*, and the Persian and Pashto forms are in fact compatible with a full grade form PIr. **uaŕća-*, with secondary labialization of the root vowel.

Although the *o*-stem **uolk-o-* is exclusively Indo-Slavic and a possible shared innovation, Gr. *λάχνη* f. ‘woolly hair, down’ < **ulk-sneh₂-* is probably from the same root (Beekes 2010: 839–40). The *sneh₂-*stem could be old or innovated within Greek, as the suffix was productive. Either way, *λάχνη* cannot be derived from a lost Greek reflex of **uolk-o-*, given the zero-grade in the root.¹³⁰

3.3.50. **uolo-* ‘tail hair (of horse)’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Possible	^N Derivation Root

Indo-Aryan: Skt. *vāra-* m. ‘tail hair, horse tail, sieve’, *vāla-* m. (TS) ‘id.’

Iranian: –

Baltic: Lith. *vālas* m. ‘fishing line; horse hair’

Slavic: –

Skt. *vāra-* (EWAia II: 545) with the variant *vāla-* (EWAia II: 547) is formally identical to Lith. *vālas*, which generally means ‘fishing line’, but also ‘horse hair’ in East Lithuanian (Derksen 2015: 485). LEW: 1188 adduces Lat. *adūlor* ‘to fawn (upon), court’, but de Vaan (2008: 25) rightly rejects this.

The stem could potentially contain the root **uel-* ‘to enclose’ or **uel-* ‘to turn’, but neither is semantically compelling. As we cannot reconstruct a plausible base from which **uolo-* could be derived in Indo-Slavic, there are no decisive arguments in favour of classifying it as an innovation. Alternatively, **uolo-* could be a substrate word, but there are no formal arguments for this.

3.4. Uncertain isoglosses

3.4.1. **b^herH-men-* ‘support; burden’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation Root

Indo-Aryan: Skt. *bhārīman-* n. ‘support, maintenance, care’

Iranian: YAv. *barəməīiaona-* adj. ‘going with a burden (?)’

Baltic: –

Slavic: OCS *brěmę* n. ‘load, burden’; Ru. (dial.) *berémja* n. ‘armful, bundle, burden’; Pol. *brzemie* n. ‘load, burden’; SCr. *brěme* n. ‘weight, load; pregnant woman’

¹³⁰ However, in view of Skt. *vrkṣá-* m., YAv. *varəša-* m. ‘tree’, one could reconstruct an *s*-stem **uelk-es-* ‘twig’ from which a possessive adjective **ulk-s-ó-* ‘having twigs’ >> ‘tree’ was derived. The same *s*-stem could have been the basis for Gr. *λάχνη* ‘woolly hair; (metaphor of) leafage’.

The Sanskrit and Slavic words are sometimes compared (e.g., Derksen 2008: 37), supposedly derived from a *seṭ*-variant of **b^her-* ‘to bear’. Mayrhofer (EWAia II: 249) instead takes Skt. *bhārīman-* as a secondary variant of *bhārman-* n. ‘support, preservation, care’, which seems possible, since the laryngeal required for *bhārīman-* is unexplained. As for *bhārman-*, it is rather an infinitive and occupies a different functional domain than *bhārīman-*.

OE *beorma* m. ‘leaven, yeast, froth’ has been derived from **b^her-me/on-* and would also be compatible with a root-final laryngeal (Wodtko, Irslinger & Schneider 2008: 16). De Vaan (2008: 213) connects *beorma* to Lat. *fermentum* n. ‘ferment; yeast’ and reconstructs **b^her(H)-mn-*. Although formally similar to Skt. *bhārīman-*, these words are rather related to Skt. *bhurāti* ‘to move rapidly’ < **b^hṛh₁-e-* and (more distantly) Lat. *ferveō* ‘to boil’ (Schrijver 1991: 253–56). Alternatively, OE *beorma* and Lat. *fermentum* may derive from **g^{wh}er-mn-* (Kroonen 2013: 306).

Semantically, the Sanskrit and Slavic words denote slightly different concepts: ‘support’ << ‘bearing’ vs. ‘load, burden’ << ‘borne’. This could indicate parallel innovations, although the meanings may reflect two sides of the same coin. Furthermore, YAv. *barəmāiaona-* (with uncertain meaning) might contain *barəman-* ‘burden’, which is equivalent to the Slavic meaning, although formally it may reflect either **b^her-men-* or **b^herH-men-*.

3.4.2. **b^hreh₁ǵ-* ‘to shine, dawn’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Uncertain (Germanic)	Compelling	Possible	Root

Indo-Aryan: Skt. *bhrāj-* ‘to shine, beam’

Iranian: YAv. *brāzaiti* ‘to shine’; Parth. *br’z-* ‘to shine’; MoP *barāzīdan* ‘to shine, beam’; Sogd. B *βr’z’nt* ‘shining’

Baltic: Lith. *brėkšti, -ta* ‘to dawn’

Slavic: OCS *probrězъ* m. ‘dawn’, Ru. (dial.) *brezg* m. ‘dawn’; Pol. *brzask* m. ‘dawn’; Sln. *brěsk* m. ‘dawn’

The root **b^hreh₁ǵ-* is listed as an isogloss by Arntz (1933: 51). It is thought to be the base of Skt. *bhūrjā-* m. ‘Himalayan birch’, ON *björk* f. ‘birch’, Lith. *bėržas* m. ‘birch’, SCr. *brěza* f. ‘birch’. However, the root structure of the Germanic and Balto-Slavic words for ‘birch’ (and further PGm. **barku-* ‘bark’, **berhta-* ‘bright’; Alb. *bardhë* ‘white’, cf. Kroonen 2013: 53, 60–61) shows a full grade **b^he/orh₁ǵ-*, which differs from the verbal stem of Indo-Iranian and Balto-Slavic (see LIV: 92; EWAia II: 279–80; Derksen 2015: 99).¹³¹ In Germanic and Balto-Slavic, the full grade of this seemingly Schwebeablauting root could be explained as analogical from the zero-grade **ur/ir* < **rH*, but the same does not hold for Alb. *bardhë* ‘white’, where a zero-grade **rH* would have given **ra*, as in Alb. *bredh* m. ‘fir’ (< **bradh*, cf. Demiraj 1997: 108). If **b^herh₁ǵ-* was the original root

¹³¹ Welsh *berth* ‘beautiful’, MBret. *brez* m. ‘prosperity’ < PCelt. **berxto-* have often been included here, but the missing laryngeal points to a different root (cf. Matasović 2009: 63).

structure, the change to **b^hreh₁ǵ-* could have been a common Indo-Slavic development, as a way to avoid heavy consonant clusters in certain forms. However, the isolated Nw. *brok* m. ‘young (speckled) salmon’ and Sw. *brokig* ‘variegated’ offer possible extra-Indo-Slavic evidence of **b^hreh₁ǵ-*, although the connection is not certain.

3.4.3. **b^huHs-* ‘to be active, strengthen’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Uncertain (Greek)	Doubtful	Possible	^V Derivation

Indo-Aryan: Skt. *bhūṣati* ‘to support, be active, strengthen’

Iranian: OAv. *būždiāi* inf. ‘to render oneself active, to make an effort’

Baltic: –

Slavic: OCS *bystrъ* adj. ‘quick’; Ru. *býstryj* adj. ‘quick’; Pol. *bystry* adj. ‘quick, sharp-witted’; SCr. *bīstar* adj. ‘clear, transparent, quick’

Derksen (2008: 71) compares the root of the Slavic adjective **býstrъ* to Indo-Iranian **b^huHs-*, since the laryngeal could explain the Slavic acute. The limited verbal paradigm of **b^huHs-* (only a thematic present in Sanskrit) suggests that it originates from **b^heh₂u-* ‘to become’ (EWAia II: 270–71, with lit.), with an *s*-extension, cf. YAv. *būšiiant-* ptc. ‘wishing to become’, Lith. *būs* 3sg.fut. ‘will be’. However, a connection could also be sought to the Greek *s*-aorist ἔφουσα ‘made grow’ (in which case Skt. *bhūṣati* could be an old aorist subjunctive), and it therefore remains uncertain whether the *s*-extension to **b^heh₂u-* is a shared Indo-Slavic formation.

3.4.4. **b^huh₂-r(i)-* ‘much, plenty’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *bhūri-* adj. ‘much, abundant, numerous, great, mighty’

Iranian: OAv. *būiri-* adj. ‘abundant’; Khot. *buro* ‘to the limit, completion’

Baltic: Lith. *būrỹs* m. ‘crowd, flock, pack, platoon’, *būrti*, *-ia* ‘to gather’; Latv. *būra* f., *būris* m. ‘lot, mass, heap’

Slavic: –

Derksen (2015: 106) tentatively accepts this etymology (see also LEW: 66). Lith. *būrỹs* and Latv. *būra*, *būris* point to derivatives in **-iio-* and **-eh₂-* from a base **b^huHr-*, in which the Latvian sustained tone proves the position of the laryngeal. Since **b^huHr-* can hardly be a Proto-Indo-European root, it seems likely that the verb Lith. *būrti* ‘to gather’ is of denominal origin. Skt. *bhūri-* and OAv. *būiri-* < PIIr. **b^huH-ri-* belong together with the comparative YAv. *baouiō* ‘longer’ and plausibly derive from **b^hauH-* ‘to become’. The derivational history of adjectives in *-ri-* is unclear,¹³² but it seems reasonable to assume that

¹³² One of the few attested cases apart from Skt. *bhūri-* is *sthūri-* ‘one-horse; pulled by one horse’ (AiGr. II, 2: 859).

it is not a primary Indo-European suffix but rather an *i*-stem to an earlier *r*-stem **b^huh₂-r-*. However, as this *r*-stem is not directly attested in either Indo-Iranian or Balto-Slavic, the etymology remains doubtful.

3.4.5. **-di-* 3rd person encl. pron.

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: –

Iranian: YAv. *-di-* encl. pron. ‘him, her, it, them’; OP *-di-* encl. pron. ‘him, her, it, them’

Baltic: OPr. *-di-* encl. pron. ‘him, her, them, one’

Slavic: –

Trautmann (1910: 266) connected the OPr. 3rd person enclitic pronoun *-di-* to YAv. *-di-* and OP *-di-* with similar function.

The exact paradigm of Old Prussian *-di-* is unclear. Bezzenger (1907: 109) takes OPr. *-ts* ‘he’ as a continuation of an old nom.sg. **-dis*, with regular syncope (see also Euler 1992: 130). However, *-ts* may also continue nom.sg.m. **tas* (Stang 1966: 410), which seems more likely, since *-ts* is syntactically different from *-di-* in that it only attaches to verbs, never to prepositions or conjunctions. Nevertheless, OPr. *-di* and *-dei* indisputably have nominative function, being attested as translations of German impersonal *man* ‘one’. Endzelin (1944: 122) takes *-di* as a nom.sg.n., which seems reasonable, if it derives from **-dit* (cf. YAv. *-diṭ*). He further takes *-dei* as a nom.pl.m. form. However, since *-dei* (which is a hapax) is functionally equivalent to *-di*, and the Old Prussian nom.pl.m. ending is generally *-ai*, it seems more likely that it reflects a spelling variant of the latter (cf. *geiwan* ‘life’ for *giwan*). In principle, *-di* may continue both the n.sg. **-dit* and n.pl. **dī*. Alternatively, both variants have been explained as reflexes of a nom.pl.m. **-djai* (Trautmann 1910: 266), but for *-di* this is formally impossible.

The accusative forms acc.sg.m./f. *-din* and acc.pl.m./f. *-dins* are more straightforward. In principle, they can be directly compared with YAv. *-dim* and *-dīš* < **-dins*. It is unclear if the variants *-dien* and *-diens* are spelling variants or reflect formal variants. According to Mažiulis (1994: 95), they arose as a result of the conflation of stem classes in the Catechisms. Alternatively, it is possible that *-dien* was modelled after acc.sg.m./f. *schien* ‘him, her’.¹³³

In Iranian, only accusative forms are attested (Bartholomae 1904: 684ff), which follow the same inflection as the enclitic YAv. 3rd person pron. *i-*, viz. YAv. acc.sg.m./f. *-dim*, acc.sg.n. *-diṭ*, acc.pl.m./f. *-dīš*, acc.pl.n. *-dī*. Caland (1909) derives Iranian **-di-* from a rebracketing of, e.g., YAv. *ād-im* ‘then ... him’ to *ā-dim*, *pasāvad-im* ‘after that... him’ to *pasāva-dim*. Caland’s scenario is difficult to reject, for several reasons: 1) *-di-* seems to be functionally equivalent to the enclitic pronouns *-i-* and **-si-* (Av. *-hi-*, OP *-ši-*, Skt. *-sīm*), 2)

¹³³ OPr. *schien* is only one of many spellings of the accusative of 3sg. pron. *schis*.

Old Avestan has only *-i-* and *-hi-*, not *-di-*, and 3) unlike *-i-* and **-si-*, *-di-* does not correspond to a known Indo-European pronominal stem (cf. Beekes 1983).

An alternative etymology connects pronominal **-di-* to a PIE deictic particle **de/o* (Pokorny 1959: 181), reflected in, e.g., Gr. ὅδε ‘this here’, OE *to* ‘to’, OCS *do* ‘towards’. This is difficult to substantiate, however, and does not help us determine whether Old Prussian *-di-* and Iranian **-di-* reflect a shared innovation. Even if Iranian **-di-* resulted from rebracketing, as in Caland’s scenario, it technically does not preclude the possibility that this development occurred as a shared innovation with Balto-Slavic. The loss of final **-t/d* in Old Prussian and Old Persian cannot be assumed to have triggered the creation of **-di-*, as this loss does not affect Avestan. This implies that **-di-* could be old (Indo-Slavic) and created through rebracketing. One final point is unexplained in this scenario, however: in Old Prussian, *-di-* also has nominative function, unlike in Iranian. This divergent syntax could indicate independent innovations. Given the above considerations, the status of **-di-* as an Indo-Slavic isogloss is doubtful.

3.4.6. **d^h(o)r-uo-* ‘firm, healthy’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *dhruvā-* adj. ‘firm, solid, secure’

Iranian: YAv. *druua-* adj. ‘healthy’; OP *duruva-* adj. ‘firm, secure, invulnerable’; MiP Pahl. *drōd* ‘health, well-being, prosperity, peace’, *drust* adj. ‘right; well, healthy’; Bactr. λρονο ‘healthy’

Baltic: –

Slavic: OCS *sъdravъ* adj. ‘healthy’; Ru. *zdorovyj* adj. ‘healthy’; Pol. *zdrowy* adj. ‘healthy’; SCr. *zdrāv* adj. ‘healthy’

The Indo-Iranian forms (EWAia I: 798–99; AirWb.: 782) can be considered to show the regular development of **-ṛuV̄-* (parallel to **-ṛiV̄-* > *-riya-*, cf. Lubotsky 1997) and thus go back to **d^hr-uā-*. OCS *sъdravъ* and its many cognates in Slavic (cf. Derksen 2008: 478) have been connected by Meillet (1902–1905: 364), who considered this to be an Indo-Slavic isogloss (1926: 172). The Slavic words have alternatively been connected (e.g., by Vasmer I: 450) to Lith. *sūdrus* ‘thick, dense’ < **h₁su-dru-* (see p. 62), but this requires the assumption that *sъ-* was analogically restored, as we would otherwise expect lengthening via Winter’s Law due to the following **d* (Derksen 2008: 478–79). The acute tone of, e.g., SCr. *zdrāv* does not presuppose a laryngeal in the root since an original **sṇ̥-dorv̥-* would have shifted to **sṇ̥-dōrv̥-* with Dybo’s Law (Derksen 2008: 479).

OIr. *derb* ‘certain’ is rather derived from **deru-* ‘wood, tree’, which is supported by OBret. *daeru* ‘oaks’ (Matasović 2009: 96). Germanic **trewwu-* ‘loyal, trustworthy’ probably reflects a similar derivation and semantic shift (Kroonen 2013: 523) and cannot in any case be related to Skt. *dhruvā-* (but cf. Harðarson 2018, who assumes secondary aspiration in Indo-Iranian).

Although the Indo-Iranian and Slavic forms seem to lack cognates in other branches, they vary in terms of root ablaut. One might try to account for this in two ways. Either the Slavic *o*-grade was inserted as a result of the compounding process, or the *o/Ø*-ablaut reflects an unattested *u*-stem that was independently thematicized in the separate branches. However, there are to my knowledge no good parallels for secondary *o*-grades in (Balto-)Slavic compounds. Reconstructing an ablauting *u*-stem is rather *ad hoc* as these are normally not thematicized in Slavic (but were generally extended by *-kṛ*) and since **-uo-* is also a primary suffix. In view of these difficulties, it seems more likely that the Indo-Iranian and Slavic stems are independent derivatives. Even if the forms ultimately go back to the same *u*-stem, it cannot be excluded that this is an inherited archaism.

3.4.7. **ǵemb^h-* ‘to suffer from cold’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	Semantics

Indo-Aryan: Skt. *hemantá-jabdha-* ‘made stiff by winter’, *jámbhate* ‘snaps at’

Iranian: (YAv. 2pl.imp. *ham-zəṇbaiaiaδβəm* ‘crush!’)

Baltic: (Lith. *žėmbti*, *-ia* ‘to cut slantwise, sharpen’)

Slavic: Ru. *zjábnut’*, *zjábnu* ‘to suffer from cold’; Cz. *zábsti*, *zebu* ‘to suffer from cold, freeze’; SCr. *zépsti*, *zébēm* ‘to freeze’

The root **ǵemb^h-* ‘to snap, bite’ is widespread in Indo-European languages and a stem **ǵomb^h-o-* ‘row of teeth, tooth’ may also be reconstructed (cf. Mumm 1999; LIV: 162; IEW: 369). Mumm (1999) has argued that Slavic and Sanskrit share a specific semantic development from ‘to bite’ >> ‘to become stiff from cold’. In Slavic, ‘to suffer from cold, freeze’ has become a basic meaning of the verb (Derksen 2008: 543). According to Mumm (1999), the general meaning ‘to suffer from cold’ would be secondary from ‘to freeze’ (i.e., ‘freeze solid’), but this chronology is difficult to substantiate from the Slavic evidence.¹³⁴ An equally likely scenario is that ‘to suffer from cold’ developed directly from ‘to bite’, as a metaphor of the feeling of cold. Once this became the general meaning of the verb, it could also mean ‘to freeze’ in reference to inanimate objects.

In Sanskrit, the meaning is only attested in the compound *hemantá-jabdha-* ‘made stiff by winter’. While *jabdha-* could be understood as ‘made stiff from cold’, it is difficult to rule out that it simply meant ‘clenched’, in the sense ‘made stiff by being bit’, with the connotation to ‘cold’ deriving from *hemantá-* ‘winter’.

¹³⁴ Mumm (1999) argues that Gr. γόμος m. ‘peg, bolt, nail’ and Ger. *Kamm* m. ‘tenon joint’ < **ǵomb^h-o-* also imply a root meaning ‘to bite’ (i.e., ‘to make stiff by biting’). However, the carpentry-related meanings of Greek and Germanic can, in my opinion, simply be derived from ‘tooth’, in a metaphorical sense, which is likely the original meaning of **ǵomb^h-o-*.

3.4.8. **ǵ^helh₃-en-* ‘green, yellow, gold’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *hīraṇya-* n. ‘gold, precious metal’, *hiraṇín-* adj. ‘rich in gold, adorned with gold’, *hiraṇmáya-* adj. ‘golden’

Iranian: YAv. *zarañiia-* n. ‘gold’, *zaranaēna-* adj. ‘golden’, *zarənu^o*, *zaranu^o* ‘gold’; MiP Pahl. *zarr* ‘gold’, Man. *zr* ‘gold’; MoP *zar* ‘gold’; Sogd. *zyrn* ‘gold’; Khot. *ysīrra-* n. ‘gold’, *ysarūna-* adj. ‘yellow, red’, *ysarra-gūnā* ‘gold-coloured’, *ysaramjsa-* ‘safflower’

Baltic: –

Slavic: OCS *zelenъ* adj. ‘green’; Ru. *zelënyj* adj. ‘green’; Pol. *zielony* adj. ‘green’; SCr. *zèlen* adj. ‘green’

Although the root **ǵ^helh₃-* is widespread in Indo-European, traces of an *n*-stem adjective **ǵ^helh₃-en-* are restricted to Indo-Iranian and Slavic. For Core Proto-Indo-European (excluding Anatolian and Tocharian, where **ǵ^helh₃-* is not attested), an *i*-stem **ǵ^helh₃-i-* may be reconstructed based on Skt. *hāri-* ‘fallow, yellowish, greenish’ and Lat. *helvus* (< **ǵ^helh₃-i-uo-*, cf. de Vaan 2008: 282), and probably a *ro*-stem **ǵ^hlh₃-ro-* based on Gr. *χλωρός* ‘pale green, greenish yellow’, since these form a ‘Caland’-pair. The reflexes in other branches may rather be analysed as innovations, e.g., PGM. **gelwa-* / **gulu-* ‘yellow’ < **ǵ^helh₃-u-* and Lith. *žėlvas* ‘greenish, yellowish’.

Skt. *hīraṇya-* ‘gold, precious metal’ and its Iranian cognates reflect **ǵ^hlh₃-(e)n-io-*, which seems to be a deadjectival *io*-stem.¹³⁵ Similarly, YAv. *zarənu^o*, *zaranu^o* ‘gold’ may be analysed as a deadjectival *u*-stem. Khot. *ysarra-gūnā* ‘gold-coloured’ < **j^harana-gauna-* (cf. YAv. *zairi.gaona-* ‘yellow-coloured, gold-coloured’) seems to reflect a thematicized *n*-stem adjective. Based on this, a Proto-Indo-Iranian adjective **j^h(a)rH-an-* ‘gold-coloured’ may be reconstructed (cf. EWAia II: 816).

The semantic difference between the Indo-Iranian **j^h(a)rH-an-* and Slavic **zelènъ* ‘green’ is trivial, as ‘yellow’ and ‘green’ do not seem to have been consistently distinguished in early Indo-European languages. It seems highly unlikely that **j^h(a)rH-an-* was innovated within Indo-Iranian, since the suffix is not productive and since the verb **j^harH-* ‘to be angry’ had undergone a semantic shift (<< ‘to grow green’). The verb is also preserved in Lith. *žėlti* ‘to grow green’. It is noteworthy that Indo-Iranian and Balto-Slavic are the only branches that attest a primary verb to this root.¹³⁶

While an inner-Indo-Iranian innovation is unlikely, Slavic **zelènъ* ‘green’ has been taken as a petrified participle from a lost Slavic cognate of Lith. *žėlti* ‘to grow green’, with the parallels OCS *studentъ* ‘cold’ ~ Ru. *studit’* ‘to cool’, SCr. *cr̃ven* ‘red’ ~ RuCS *čr̃viti* ‘to dye, redden’ (Vaillant IV: 620). However, in both cases, the verb is denominal and

¹³⁵ Skt. *hiraṇín-* ‘rich in gold, adorned with gold’ is from **hiraṇyín-* and does not prove the existence of an *n*-stem in Indo-Aryan (AiGr. II, 2: 328). Skt. (TS) *hiraṇmáya-* ‘golden’ is a late replacement of *hiraṇyáya-* ‘golden’ (AiGr. II, 2: 769).

¹³⁶ According to LIV: 178, Indo-Iranian **j^harH-* ‘to be angry’ is unrelated, but in my opinion the semantics are compelling.

transitive. As such, although it remains uncertain, it seems difficult to entirely reject the possibility that **zelèn̥* ‘green’ is inherited and cognate with PIIr. **j^(h)(a)rH-an-* ‘gold-coloured’.

3.4.9. **ǵ^(h)(u)rstuo/eh₂-* ‘stone, gravel, sand’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: –

Iranian: YAv. *zarštuua-* n. ‘stone’

Baltic: Lith. *žvirgždas* m. ‘gravel, pebble’; Latv. *zvirgzds* m. ‘pebble’

Slavic: Ru. (dial.) *žerstvá*, *gverzdá*, *gverstvá* (Novg.), *gverstá* (Novg., Pskov) f. ‘coarse sand’; Pol. (dial.) *żarstwa*, *żerstwa* f. ‘coarse sand’

There are several problems regarding the proposed connection between the Indo-Iranian and Balto-Slavic words, both within and between the branches.

YAv. *zarštuua-* ‘stone’ has been compared to Skt. *ḍṛśád-* f. ‘stone, mill stone’ (Insler 1999), under the assumption that the Sanskrit anlaut *d-* reflects a dissimilated **j-*. Such a dissimilation is not unparalleled, cf. *dáśyati* ‘to waste, become extinguished’ ~ *jáśyati* ‘to be starved, disappear’, but here the development seems to be conditioned by a following *-y-* (Kulikov 2012: 536ff, 551ff). Moreover, *ḍṛśád-* seems to show a suffix *-ád-* which would be rather unlikely from an Indo-European perspective; suffixes generally do not contain *media*. Insler (1999) reconstructs an ablauting *d-*stem based on the idea that YAv. *zarštuua-* goes back to a nom.sg. **jérs-d-s*, whereas Skt. *ḍṛśád-* reflects the oblique stem **jrs-éd-*. According to him, this would also explain the voiceless *t* in Avestan as the result of levelling from the strong stem, but this is mere speculation.¹³⁷ Moreover, YAv. *zarštuua-* may equally well reflect a zero-grade in the root with the regular sound change **j_s > YAv. arš* (see de Vaan 2003: 522).

Balto-Slavic displays a host of variants which nevertheless are semantically very close and probably reflect the same Proto-Balto-Slavic form (for a more detailed analysis of the material, see Young 2005; also Derksen 2015: 252). The attested forms vary in terms of initial **ǵ^(h)* (Baltic) vs. **ǵ^(h)* (Slavic) followed by **-u-* (Baltic and Slavic) or not (Slavic), and in terms of **-st(u)-* (Slavic) vs. **-zd-* (Baltic and Slavic). The vacillating initial consonant is probably connected to the Balto-Slavic depalatalization before resonants, although the details are unclear.¹³⁸ As for the **-u-* in the root, Young assumes that it originated in the suffix **-tuo/eh₂-*. In forms like Lith. *žvirgždas* and Ru. *gverstá*, then, the

¹³⁷ Interestingly, the parallel Insler offers for **jérs-d-s* / **jrs-éd-* and the levelling in Avestan is OAv. *-biš-* ‘medicine’ ~ YAv. *bišaziia-* ‘to cure’ ~ Skt. *bhiśáj-* ‘physician’, which is likely a non-Indo-European substrate word (Lubotsky 2001b: 310). Even if it were old, it would not be compelling, however, since there is no evidence that OAv. *-biš-* contains the suffix **-(a)j-*.

¹³⁸ As no root ablaut is attested, the alternation between **ǵ^(h)* and **ǵ^(h)* is difficult to explain within Kortlandt’s (1978b) framework, which assumes that palatals were depalatalized before resonants and a following back vowel. Assuming that depalatalization happened irrespective of the vocalism, it would be difficult to explain the restoration of palatal **ǵ^(h)*, as there is no model.

position of **-y-* is the result of “anticipatory displacement”. The Novgorod form *gverstvā* would then reflect an intermediate form, with **-y-* in both root and suffix. Alternatively, both the root and the suffix may originally have had **-y-*, after which the various languages and dialects dissimilated either the first or the second **-y-* (Anthony Jakob, p.c.). In this scenario, one would have to assume that Iranian dissimilated the **-y-* of the root.¹³⁹

Finally, according to Young (2005), *-zd-* reflects the original form, whereas devoiced *-st(u)-* reflects **-zd-* + *-tuo/eh₂-*. This would allow for a connection between Balto-Slavic **ǵrzd-tuo/eh₂-* and a group of words denoting various types of cereals, represented by Lat. *hordeum* n. ‘barley’ < **g^h(o)rsd-*, OHG *gersta* f. ‘barley’ < **g^hersd-*, Alb. *drihtë* f. ‘cereal, grain’, and Hitt. *karaš* n. ‘wheat, emmer wheat’. However, given that **ǵ^(h)(u)rstuo/eh₂-* ‘stone, gravel, sand’ has no agricultural connotation, it is likely unrelated to the cereal words.¹⁴⁰ Furthermore, Ru. (dial.) *gverzdá* is difficult to explain if *-zd-* is original, since in that case the *-y-* in the root cannot be explained as displaced from the suffix. Rather, we may assume that the variants with voiced *-zd-* are secondary. In the case of Lith. *žviřgždas* etc., the voicing could have been taken over from Lith. (dial.) *žiegždrà* f. ‘coarse sand’ ~ OPr. *sixdo* f. ‘sand’, which seems to reflect a different root.

In sum, the Balto-Slavic material is difficult to account for and any explanation must invoke irregular and/or analogical developments. While the Balto-Slavic and Iranian words are difficult to separate, the etymology is classified as doubtful, due to the many formal problems.

3.4.10. **g^wrh₃-e/o-* ‘to devour, swallow’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^v Derivation

Indo-Aryan: Skt. *girāti* ‘to devour, swallow’

Iranian: Psht. *nyar-* ‘to swallow’; Wakh. *nəž(γ)ər-* ‘to swallow’

Baltic: –

Slavic: OCS *požřěti*, *požbrq* ‘to swallow, devour’; ORu. *žbrati*, *žbru* ‘to eat (of animals), gobble’; Pol. *žreć*, *żreć* ‘to eat greedily’; Sln. *žrěti*, *žrèm* ‘to eat (of animals), gobble’

Arntz (1933: 45) lists the present stem now reconstructed as **g^wrh₃-e/o-* as an Indo-Slavic isogloss. The root is widely attested in other stem types, e.g., Arm. aor. *eker* ‘ate’, Gr. βιβρώσκω ‘to eat, digest’, Lat. *vorō* ‘to devour’, but a present stem **g^wrh₃-e/o-* does not seem to be found outside of Indo-Iranian and Slavic.

However, the expected outcome of **g^wrh₃-e/o-* in Slavic is ***g^wbre/o-*, since the labiovelar would have coloured the vocalized **r* to **ur* in Proto-Balto-Slavic.¹⁴¹ Thus, the palatalization in the attested form OCS *po-žbrq* etc. implies that it is a secondary formation

¹³⁹ If true, this would be a further indication that Skt. *dṛśád-* is unrelated, as there was no motivation for dissimilation of the initial cluster here.

¹⁴⁰ A semantic change from ‘cereal’ > ‘sand’ in Balto-Slavic and Iranian is unlikely. Although the opposite change from ‘sand’ > ‘grain’ is not inconceivable, it is extremely unlikely that Latin, Germanic, Albanian, and Hittite independently underwent this innovation.

¹⁴¹ The origin and conditioning factors of the reflexes PBSl. **ir/ur* < PIE **r* are debated, cf. p. 27, fn. 13.

within Slavic rather than a direct cognate to Skt. *girāti*. The palatalization may have originated in the aorist OCS *po-žrěť* ‘devoured’.

Nevertheless, the parallelism in the paradigm of **g^werh₃-* in Indo-Iranian and Slavic is noteworthy. A thematic present with zero-grade in the root is only attested for seven roots in Old Church Slavic (Vaillant III: 189–90). These all have corresponding root aorists (e.g., OCS *po-žrěť* ‘devoured’), which is also the case for Skt. *girāti* (aor. *gar-/gr-*). It is not impossible that a phonologically regular form **g^wre/o-* would have existed in Pre-Proto-Slavic, only to be replaced by **ž^wre/o-* by analogy to the aorist. However, as this is impossible to verify, the isogloss is classified as uncertain.

3.4.11. **Huep-* ‘to call’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	Root

Indo-Aryan: –

Iranian: OAv., YAv. *ufiia-* ‘to sing’; Sogd. BMS *w’β* ‘to say, speak’

Baltic: –

Slavic: OCS *vъpiti*, *vъpijō* ‘to call, cry out’; Ru. *vopít’*, *vopljú* ‘to cry out, wail’; Cz. *úpěti*, *úpím* ‘to wail, howl’; SCr. *vàpiti*, *vàpijēm* ‘to cry out, summon’

Iranian and Slavic share a possible verbal root **Huep-* ‘to call’. Av. *ufiia-* ‘to sing’ has traditionally been connected to Skt. *vabh-* ‘to weave’ with secondary *f* < **b^h* (AirWb.: 1346; LIV: 658). However, as Cheung (2007: 401) points out, the other Iranian languages show that we are dealing with two separate roots. In East Iranian, *β* has been levelled throughout the paradigm based on the verbal adjective **uβda-* < **ufta-*, cf. Sogd. *w’β*. The *-f* in, e.g., Sogd. CM *w’f* ‘to weave’ may be due to laryngeal devoicing in Iranian (Kümmel 2012a).

As for the Slavic verb, it is usually compared to Latv. *ūpēt* ‘to howl’ (LEW: 1169). However, the Latvian verb is likely denominal from Latv. *ūpis* ‘owl’, cf. also Lith. *ūpas* ‘echo’ etc. The Baltic words are probably related to CS *vypl’b* ‘seagull’ (Derksen 2008: 535), reflecting PBSl. **uHp-*, possibly from **Hup-* with metathesis. OCS *vъpiti* ‘to call, cry out’ would then have to contain a secondary zero-grade.

While it is possible to compare the Iranian and Slavic forms, the connection is uncertain, and the words (especially in Slavic) could also reflect later onomatopoeic formations.

3.4.12. **h₁ēd* / **h₁ōd* adv. ‘then, and, so’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Uncertain (Albanian)	Doubtful	Possible	^N Derivation

Indo-Aryan: *āt* adv. ‘afterwards, then, and, further, so’

Iranian: OAv. *āt*, YAv. *āat* adv. ‘afterwards, then, and’

Baltic: Lith. *ō* conj. ‘and, but’, *ẽ* conj. ‘and, but, however’

Slavic: OCS *a* conj. ‘and, but’; Ru. *a* conj. ‘and, but’; Pol. *a* conj. ‘and, but’; SCr. *a* conj. ‘and, but’

Indo-Iranian adverbs reflecting PIIr. **Hāt* ‘afterwards, and, then’ and Balto-Slavic conjunctions meaning ‘and, but’ have been compared and constitute a potential Indo-Slavic isogloss. Derksen (2015: 339) reconstructs **h₁ōd* for Lith. *ō* and the Indo-Iranian and Slavic forms. Fraenkel (LEW: 117–18) also supports this, dismissing the idea that Lith. *ō* would be borrowed from Slavic, but remarks that Lith. *ẽ* may just as well be the true cognate of PIIr. **Hāt*. Mayrhofer (EWAia I: 163) tentatively connects PIIr. **Hāt* to Lith. *ẽ* and OCS *i* ‘and’, the latter being unlikely, since it should rather reflect, e.g., **h₁ei* (Derksen 2008: 207). Additionally, Albanian *e* ‘and’ has been connected (Orel 1998: 85), although it has alternatively been explained as a borrowing from Latin *et* ‘and’ or Slavic **a* ‘and, but’.

As for the relationship between the Balto-Slavic and Indo-Iranian forms, I see four possible scenarios: 1) Lith. *ō* and Slav. *a* go back to **h₁ōd* and are related to Indo-Iranian **Hāt*. 2) Lith. *ō* is borrowed from Slavic *a*, which reflects **h₁ōd* and is related to Indo-Iranian **Hāt*. 3) Lith. *ō* and Slavic *a* are related and reflect **h₁ōd* (or **h₁ād*), whereas Lith. *ẽ* is related to Indo-Iranian **Hāt*, going back to **h₁ēd*. 4) Lith. *ō* is borrowed from Slav. *a*, which together with Lith. *ẽ* reflects **h₁ēd* and is related to Indo-Iranian **Hāt*. In this scenario, the Slavic development is paralleled by *azъ* ‘I’ < *jazъ* < **ēzъ* < **h₁eǵ-om*, where **j-* was apparently lost, but it is unexpected that there is no attested variant of Slav. *a* with initial *j-*, unlike in the case of *azъ*, *jazъ* ‘I’.

Scenarios 1 and 2 have the disadvantage of leaving Lith. *ẽ* without an etymology. Scenario 3 leaves Lith. *ō* and Slav. *a* without an Indo-European etymology (since it is unlikely that **h₁ēd* was remade to **h₁ād* after the productive Balto-Slavic ablative ending **-ād*). Scenario 4 explains the variants *ō* and *ẽ* in Lithuanian, as well as the origin of both the Baltic and Slavic forms. The reconstruction **h₁ēd* is supported by the Hittite pronominal forms abl.sg. *kēt* ‘from this’ < **kéd*, instr.sg. *apet* < **Hob^héd* (see further Kloekhorst 2008: 191, 426). In Core Proto-Indo-European, an abl.sg. **h₁é-d* may have undergone monosyllabic lengthening, yielding **h₁ēd*.

However, scenario 4 does not take into account Alb. *e* ‘and’, which, if inherited, can reflect **h₁ōd* (but not **h₁ēd*). As **ē* and **ō* merge in Indo-Iranian, it cannot be determined if PIIr. **Hāt* is closer to Albanian or Balto-Slavic, or if all three branches share **h₁ōd*, in which case Lith. *ẽ* is left unexplained. Ultimately, this means that the isogloss is uncertain.

3.4.13. **h₁iti* adv. ‘so, in this manner’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Uncertain (Italic)	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *īti* adv. ‘so, in this manner’

Iranian: OAv. *ūtīti*, YAv. *uiti* adv. ‘so, in the following manner’

Baltic: Lith. *it* adv. ‘as if, like’

Slavic: –

Lith. *it* ‘as if, like’ has often been connected to Skt. *īti* ‘so, in this manner’ (LEW: 189).¹⁴² The quality of the lost final vowel in the Baltic form is uncertain, but according to Skardžius (1938: 87) the pre-vocalic variant Lith. *ič* (< **itj*) shows that *it* derives from **iti*. This adverb possibly contains the pronominal stem **h₁i-* (Smoczyński 2018: 438) with the Indo-Anatolian abl.sg. ending **-ti*, cf. **h₁eti*, **proti*. In this case, **h₁iti* may be understood as an archaic form that underwent a shared lexicalization in Indo-Slavic.

However, Skt. *īti* has alternatively been compared to Lat. *ita* ‘in the same way as, thus’, which may be connected under a reconstruction **ith₂* with vocalization of the final laryngeal (thus Dunkel 2014: 368). Possibly, Lith. *it* could also be included in this cognate set. This etymology has the disadvantage that **(H)itH* is morphologically opaque, but it cannot be rejected on phonological or semantic grounds, which leaves the potential Indo-Slavic isogloss uncertain.

3.4.14. **h₂eid^h-smo-* ‘firewood’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Uncertain (Germanic)	Doubtful	Possible	^N Derivation

Indo-Aryan: (Skt. *idhmá-* m. ‘fuel, firewood’)

Iranian: YAv. *aēśma-* m. ‘firewood’; MiP Pahl. *ēzm*, Man. *ymg* ‘firewood’; MoP *hēzum* ‘firewood’; Sogd. B *zmy* ‘firewood’

Baltic: Lith. (dial.) *iesmẽ* f. ‘amount of firewood that is thrown into the oven or stove at the same time’

Slavic: –

Arntz (1933: 56) listed the Lithuanian and Avestan words, which have traditionally been compared (IEW: 11–12), as an Indo-Slavic isogloss. The stem is generally derived from **h₂eid^h-* ‘to kindle’ (cf. Skt. *edh-* ‘to kindle’, Gr. *αἶθω* ‘to kindle’), which is not attested as a verbal stem in Baltic. However, the etymology must be considered doubtful, since the acute root of Lith. *iesmẽ* remains unexplained under this reconstruction (Derksen 2015: 197). Yet, the words are difficult to separate given their semantic and (almost) formal similarity. A potential explanation is that the Lithuanian acute was introduced by analogy from the zero-grade **h₂id^h-*, which had undergone laryngeal metathesis to **ih₂d^h-* (Pronk 2011: 315).

¹⁴² OAv. *ūtīti*, YAv. *uiti* may continue **h₁iti* with analogical anlaut taken from *uta* ‘and’.

Even if the etymology is accepted, however, a problem is ON *eimr* m. ‘fire, smoke, steam’, which could reflect **h₂eid^h-smo-*. Although **h₂oi-mo-* would be a more straightforward reconstruction, OHG *eit* m. ‘fireplace, pyre’ < **h₂oid^h-o-* (cf. Skt. *édha-* m. ‘firewood’) ensures the continuation of **h₂eid^h-* in Germanic, which is widely attested in Indo-European, including in verbal stems in Indo-Iranian and Greek (LIV: 259).¹⁴³ Semantically, ON *eimr* m. ‘fire, smoke, steam’ is distinct from the Iranian-Baltic correspondence, so it could be argued that it reflects an independent formation, or that Indo-Slavic underwent a shared semantic shift, but this remains uncertain.

3.4.15. **h₂sus-ko-* ‘dry’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *śúṣka-* adj. ‘dry’

Iranian: YAv. *huška-* adj. ‘dry’; OP *^huška-* adj. ‘dry’; MiP Pahl. *hušk* adj. ‘dry’; MoP *xošk* adj. ‘dry’; Khot. *huška-* adj. ‘dry’; Oss. I *x_əyšk’* / D *xusk’(æ)* adj. ‘dry’; Psht. *wuč* adj. ‘dry’; Wakh. *wəsk* adj. ‘dry’

Baltic: Lith. *sùskis* m./adj. ‘mange; mangy’; Latv. *sušķis* m./adj. ‘mange; mangy, unclean’

Slavic: –

Arntz (1933: 52) listed the above Indo-Iranian and Baltic velar-suffixed forms as an isogloss. A direct comparison is also advocated by Wodtko, Irslinger & Schneider (2008: 346).

According to Lubotsky (1985), Indo-Iranian **Hsuška-* is a denominal formation from the PIE adjective **h₂(e)s-us-*, since **-ka-* is not a deverbal suffix. This innovative *ka-* stem would eventually have replaced the original adjective. The Baltic words can in principle be derived from a similar *ko-* stem, with the difference that here the Proto-Indo-European adjective was continued as a thematic stem, viz. Lith. *saūsas* ‘dry’. In Baltic, **h₂sus-ko-* would then have acquired more specific semantics than in Indo-Iranian. However, it is also possible to view Lith. *sùskis* etc. as an inner-Baltic formation based on the deverbal noun *sùsas* m. ‘mange, ringworm, scabies’ (Smoczyński 2018: 1331). This derivational pattern is paralleled by, e.g., *strùtos* f.pl. ‘manure, urine’ ~ *srùtkis* m. ‘any old thing, junk’, and has the advantage of explaining the semantic closeness between Lith. *sùsas* m. ‘mange, ringworm, scabies’ and *sùskis* m./adj. ‘mange; mangy’.

¹⁴³ Conversely, a root **h₂ei-* ‘to kindle’ is only inferred based on the idea that **h₂eid^h-* is an extended variant of the root of **h₂ei-es-* ‘copper’, which is semantically unconvincing. Furthermore, **h₂ei-* is not found in any other nominal or verbal derivations.

3.4.16. **h₂ueh₁-iu-* ‘wind’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *vāyú-* m. ‘wind, air, god of wind’

Iranian: YAv. *vaiiu-* m. ‘air, atmosphere, a god’

Baltic: Lith. *vėjas*, *vėjus* m. ‘wind’; Latv. *vējš* m. ‘wind’

Slavic: –

Schmidt (1872: 50), Arntz (1933: 50), and Porzig (1954: 169) take the Indo-Iranian *u*-stems (EWAia II: 544) and Lith. *vėjas* (LEW: 1216) as an Indo-Slavic isogloss. While the suffixes of these words do not match, some Lithuanian varieties show a *u*-stem (Derksen 2015: 496). However, this may be a dialectal innovation, given that Latv. *vējš* also presupposes an *o*-stem. An *o*-stem has been argued to be reflected in YAv. voc.sg. *vaiiō*, acc.sg. *vaēm* (AirWb.: 1357–58). Although the vocative probably reflects a regular sound change **-iau > -iiō* (de Vaan 2003: 366), the accusative *vaēm* is more difficult to explain away (de Vaan 2003: 326). Remmer (2011) argues that *vaēm* is secondary to a more archaic acc.sg. *vaiiqm* (Ny 1.1), which may continue an amphikinetic acc.sg. **h₂ueh₁-iou-m* with Stang’s Law. Indeed, it seems more economical to assume that *vaēm* is secondary than to reconstruct an *o*-stem next to a *u*-stem for Proto-Indo-Iranian based on a single form in an otherwise uniform paradigm.

3.4.17. **ieh₂-* ‘to drive’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^V Derivation

Indo-Aryan: Skt. *yāti* ‘to drive (fast), speed’

Iranian: –

Baltic: Lith. *jóti*, *jója* ‘to ride’; Latv. *jāt*, *jāju* ‘to ride’

Slavic: OCS *jaxati*, *jado* ‘to go, ride’; Cz. *jeti*, *jedu* ‘to ride, drive’

The root **ieh₂-* (possibly **h₁ieh₂-*) is attested in several branches, e.g., Lat. *iānus* m. ‘arched passage, doorway’, OIr. *áth* m. ‘ford’ < **iātu-*, perhaps OIr. *á* ‘chariot’ (Matasović 2009: 434–35), ToA *yā-* ‘to go, ride’, ToB *iyā-* ‘to go, travel; lead’, reflecting a reduplicated present (Adams 2013: 71). However, the secondarily suffixed verbal stems of Lith. *jóti*, *jója* and Cz. *jeti*, *jedu* (see Derksen 2008: 154; 2015: 212–13) probably reflect an old root present corresponding to Skt. *yāti* (LIV: 309–10). Meillet (1926: 171) and Arntz (1933: 51) took the verbal stem of **ieh₂-* as an Indo-Slavic isogloss, although they did not know about the Tocharian evidence. In either case, the root present is a potential isogloss, provided that the analysis of the Balto-Slavic forms is correct, as Tocharian has a different stem. However, as the root present is an archaic category, it is not unlikely that **ieh₂-* is a shared archaism.

3.4.18. **keh₁k^(w)-o/eh₂-* ‘green edible plant’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Uncertain (Germanic)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *śāka-* n. ‘potherb, vegetable’ (Sū.+)

Iranian: –

Baltic: Lith. *šėkas* m., *šėka* f. ‘freshly mown green crops for feeding animals’; Latv. *sēks* m., *sēka* f. ‘freshly mown grass (also clover, vetch) for feeding animals’; OPr. *schokis* m. ‘grass’ (EV)

Slavic: –

Arntz (1933: 43) listed the Sanskrit and Baltic words as an isogloss. However, ON *há* f. ‘aftermath, hay of the second crop’, which can reflect **keh₁k^w-eh₂-* (de Vries 1977: 199), cannot be excluded as an additional cognate.¹⁴⁴ On the other hand, it seems quite attractive to reconstruct ON *há* as PGm. **hawō-* and connect it to ON *hey* n. ‘hay’ < PGm. **hauja-*, which is derived from **hawwan-* ‘to hew, chop’ < **koh₂u-*.

The relationship between East Baltic **šėkas* and OPr. *schokis* is unclear. Since *sch-* is not regular before **ā*, Mažiulis (2012) assumes an original ablauting stem **šėka-* / **śāka-*, where **s-* < **ś* was palatalized before **ē*. The origin of this supposed ablaut is unclear, however.

3.4.19. **kei-* ‘to be orphaned’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	Semantics

Indo-Aryan: Skt. *śayú-* m. ‘orphan, fatherless one’

Iranian: YAv. *saē* ‘orphan’; MiP Man. *s’ywg* ‘orphan’; Khot. *syūta-* ‘orphan’; Oss. I *sižær* / D *sezær* ‘orphan’

Baltic: Lith. *šeirỹs* m. ‘widower’, *šeirė* f. ‘widow’

Slavic: OCS *sirъ* adj. ‘orphaned’; Ru. *síryj* adj. ‘orphaned’; Cz. *sirý* adj. ‘abandoned, lonely, childless’

Arntz (1933: 53) listed the above words as an Indo-Slavic semantic isogloss (see also Vasmer II: 628; Derksen 2015: 442).

The Lithuanian words derive from an unattested adjective **šeira-* (Smoczyński 2018: 1361), cognate with the Slavic adjective, which likely did not only mean ‘orphaned’, but also ‘abandoned’ vel sim., cf. Cz. *sirý* ‘abandoned, lonely, childless’.

Formally, **kei-u-* and **kei-ro-* can be derived from **kei-* ‘to lie’, although the semantic connection is unclear. Other forms with similar semantics, presumably from the same root **kei-* ‘to lie’, include **koi-m-* (Latv. *sàime* f. ‘members of a household’, ON

¹⁴⁴ According to Eichner (1975: 81 fn. 5), Hitt. *kikla-* ‘kind of herb (?)’ reflects **kēko-lo-*, but the assumed syncope is not regular in Hittite.

heimr m. ‘home’) and **kei-uo-* (Goth. *heiwa-frauja-* m. ‘master of the house’, Lat. *cīvis* m./f. ‘citizen’, Latv. *siēva* f. ‘wife’, Skt. *śéva-* adj. ‘dear, precious, friendly’). This shows that **kei-* is often the basis for nominal derivatives denoting various familial relationships, which could explain the meaning ‘orphan’ of the Indo-Iranian and Balto-Slavic forms in question. Since they are not formally identical, it is difficult to assess the likelihood of a shared semantic development, but independent innovations can hardly be excluded.

Arm. *sēr* ‘fondness, love’ and the denominal *sirem* ‘to love’ reflect **kei-ro-*. Although semantically distant, it is difficult to exclude that this reflects the same formation as the Balto-Slavic forms, which would allow the proposed isogloss to be definitively rejected.

3.4.20. **kolH-to-* ‘cold’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: –

Iranian: YAv. *sarəta-* adj. ‘cold’; MiP Pahl. *sard* adj. ‘cold’; MoP *sard* adj. ‘cold’; Sogd. B *srt* adj. ‘cold’; Khot. *sāḍa-* adj. ‘cold’; Oss. *sald* ‘cold’ (noun), I *sælyn* / D *sælun* ‘to freeze’

Baltic: Lith. *šáltas* adj. ‘cold’; Latv. *saļts* adj. ‘cold’; OPr. *salta* adj. ‘cold’

Slavic: –

The Iranian and Baltic forms have been derived from a shared adjective stem (AirWb.: 1566; LEW: 960–61; Derksen 2015: 439). The root **kelH-* is further reflected in, e.g., Skt. *śisīra-* m./n. ‘early spring, cold, frost’, PGm. **hihelōn-* f. ‘hoarfrost’ (Kroonen 2013: 226), Lith. *šálti* ‘to freeze’, Lith. *šalnà* f., Latv. *saļna* f. ‘light frost’, OCS *slana* f. ‘hoarfrost’. Arm. *sarñ* ‘ice, cold’ is unrelated (Martirosyan 2010: 569).

The etymology and reconstruction of **kolH-to-* are problematic for two reasons. First, the vocalism of YAv. *sarəta-* etc. is ambiguous, reflecting **kelH-to-*, **kolH-to-*, or **klH-to-*. Although not in Avestan, verbal stems from this root are attested in, e.g., MiP Pahl. *afsar-* ‘to cool down’, caus. *afsār-* ‘to cool’, Parth. *wys’r* ‘to cool off’, Khwar. *sry-* ‘to become cold, freeze’, caus. *s’ry-* (Cheung 2007: 336–37). While verbal adjectives in **-to-* occasionally show full grade in the root in Indo-Iranian (cf. AiGr. II, 2: 551), it is more straightforward to take YAv. *sarəta-* etc. as a regular verbal adjective **klH-to-*. Second, the Baltic forms look like regular deverbal adjectives from the infinitive stem, e.g., Lith. *šálti* ‘to be freezing, cold’. The Baltic *o*-grade has been suggested to originate in the perfect stem (LIV: 323); alternatively, it could be denominal.

In sum, there is no compelling reason to equate the Iranian and Baltic forms directly under a morphologically peculiar **kolH-to-*, and the isogloss is at best uncertain.

3.4.21. **keh₂-mo-* ‘desire’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *kāma-* m. ‘wish, desire’

Iranian: OAv., YAv. *kāma-* m. ‘wish, desire’; OP *kāma-* m. ‘wish, desire’; MiP Pahl. *kām*, Man. *k’m*, *q’m* ‘will, desire, purpose’; MoP *kām* ‘will, desire, purpose’; Sogd. B *k’m*, C *q’m* ‘wish’; Oss. *kom* ‘consent’

Baltic: Latv. *kāmēt*, *kamēju* ‘to hunger’

Slavic: –

Arntz (1933: 42) listed this *mo*-stem as an isogloss. The etymology, according to which Latv. *kāmēt* ‘to hunger’ is denominal from an unattested Baltic **kāma-*, is further supported by Fraenkel (LEW: 221) and Smoczyński (2018: 497).

The comparison is formally and semantically possible, but the precise origin of PIIr. **kaH-ma-* is unclear. Within Indo-Iranian, the root **kaH-* ‘to desire’ (< **keh₂-*, cf. Lat. *cārus* adj. ‘dear’, OIr. *caraid* ‘to love’) can hardly be separated from **kanH-* / *čanH-* ‘to be pleased with’, cf. Skt. aor. *ākāniṣ-*, *cānas-* n. ‘delight, satisfaction, tendency’, YAv. *cinman(a)-* n. ‘desire’. Although the roots are semantically slightly different synchronically (Narten 1964: 94), **kanH-* / *čanH-* may have been extracted from a nasal present stem underlying Skt. pres.ptc. *kāyamāna-*, OAv. 1sg.pres.subj. *kaiiā* < **k-n-H-ie/o-*, cf. Skt. *mathāyāti* ‘to rob, take away’ with the corresponding nasal present *mathnāti* ‘id.’. Thus, PIIr. **kaH-ma-* may reflect either **keh₂-mo-* or **knH-ma-*, of which only the former can be compared with Latv. *kāmēt*.

Against a reconstruction **keh₂-mo-*, it may be argued that nouns in *-mo-* generally take *o*-grade in the root (Brugmann 1892: 160). An *e*-grade rather points to an adjective, cf. **kieh₁-mo-* (p. 67), but there is no indication that PIIr. **kaH-ma-* was originally an adjective. The connection to Latv. *kāmēt* should therefore be considered doubtful.

3.4.22. **kenH-* ‘to dig’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	Root

Indo-Aryan: Skt. *khaní-* ‘to dig’, *khaní-* adj. ‘burrowing’, (Ragh.) f. ‘mine’, (Lex.) *khanī-* f. ‘mine’

Iranian: YAv. *kan-*, *kənti* ‘to dig’; OP *kan-* ‘to dig’; MiP Pahl. *kan-*, Man. *qn-* ‘to dig; to raze, destroy’; MoP *kandan* ‘to dig (out)’; OKhot. *kaṃggan-* ‘to dig’; Sogd. BM *kn-*, CM *qn-* ‘to dig (out)’; Psht. *kan-* ‘to dig’; Wakh. *kyn-* ‘to dig’

Baltic: Lith. *kinis* m. ‘den, lair (of a pig, boar, bear); bird’s nest; bedding, litter for animals’

Slavic: –

Arntz (1933: 36) compares Lith. *kinis* m. to Skt. *khaní-* f. directly, but the difference in gender suggests that these are independent formations. The adjective *khaní-* ‘burrowing’

can hardly be a direct cognate of the Lithuanian noun. However, it is possible that Lith. *kinis* derives from the root **kenH-*, which is well attested in Indo-Iranian, but not otherwise found in Balto-Slavic or other branches of Indo-European.¹⁴⁵

Indo-Aryan and Iranian do not agree as to the aspiration in the anlaut (see EWAia I: 446 with lit.). Skt. *kh-* has traditionally been explained as analogical from *khā-* f. ‘spring, source’, but this is semantically unconvincing. It remains unclear exactly from where the Sanskrit aspiration originates,¹⁴⁶ but it does not preclude a reconstruction **kanH-* for Proto-Indo-Iranian.

Admittedly, the derivation of Lith. *kinis* from **kenH-* ‘to dig’ is very uncertain (thus Smoczyński 2018: 545), since the semantics of the former allow for alternative interpretations. However, the etymology cannot be rejected on formal or semantic grounds and will therefore be classified as an uncertain root isogloss.

3.4.23. **k^(w)erċ-* ‘to become lean, emaciate’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^v Derivation

Indo-Aryan: Skt. *kṛśyati* ‘to become lean’, *cakārśa* ‘to become lean’

Iranian: –

Baltic: Lith. *kāršti*, *-ta*, *-ia* ‘to reach the end of one’s life, become frail with age, die; to ripen’; Latv. *kārst*, *-tu* ‘to grow old, ripen’

Slavic: Cz. *krsati*, *krsnouti* ‘to decrease, decline’

Arntz (1933: 56) took the fact that verbal stems from the root **k^(w)erċ-* ‘to become lean, emaciate’ are only attested in Balto-Slavic and Indo-Iranian as an Indo-Slavic isogloss. The root is further attested in the adjective **k^(w)erċ-o-* ‘lean, skinny’, cf. ON *horr* ‘lean’, Skt. *kṛśá-* ‘lean, thin, emaciated’, Sogd. B *’ks-* ‘small, thin’.

While it is true that no other branches continue verbal forms from **k^(w)erċ-* (LIV: 355), there are no directly cognate formations in Indo-Iranian and Balto-Slavic. Sanskrit has a *ie/o*-present and a perfect that may be old (Kümmel 2000: 140). The acute intonation of Lith. *kāršti*, which is inflected either as a *ie/o*-present or as a *sta*-present, has been attributed to the inchoative suffix **-sta-* (Smoczyński 2018: 495). Derksen (2015: 228) doubts this, since analogical *métatonie rude* is uncommon for verbs with *o*-grade. I find it difficult to reject, however, since the different inflections are synonymous. In this case, Lith. *kāršti* may go back to a perfect form (explaining the *o*-grade) cognate with Skt. *cakārśa* (Kümmel 2000: 140), which is a potential isogloss.

¹⁴⁵ OPhryg. *keneman* ‘(part of) a monument’ is formally possible (see further Lubotsky 1988a: 15), but semantically much too uncertain to be plausibly connected here. Lat. *caenum* n. ‘mud, filth, slime’ has traditionally been adduced (LEW: 254; cf. also Walde 1910: 108), but the connection to Lith. *kinis* is formally impossible.

¹⁴⁶ Kümmel (2000: 151–52) derives **kanH-* from a nasal present of **kaH-* (which would be preserved in *khā-* ‘spring, source’), which is possible, but still does not explain the origin of the initial aspirate.

3.4.24. **k^(w)leik-* ‘to torment’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	Root

Indo-Aryan: Skt. *kleś-* ‘to trouble, torment’

Iranian: –

Baltic: Lith. *klišas* adj. ‘club-footed, bow-legged, lame, crooked’, *klišės* f.pl. ‘crab’s claws, pincers’, *klišti* ‘to become deformed (about the foot), start limping’

Slavic: Ru. *klěšči* f.pl. ‘claws, pincers’; Pol. *kleszcze* f.pl. ‘pincers’, (dial.) *kleścić* ‘to castrate’; SCr. *klijěšte* f.pl. ‘pincers’, *klijěštiti* ‘to squeeze’

Arntz (1933: 35) listed this root as an Indo-Slavic isogloss.

The Balto-Slavic root is compatible with **k^(w)leik-*, but no shared Proto-Balto-Slavic derivatives can be reconstructed. The Lithuanian forms all seem to derive from the adjective *klišas* (Smoczyński 2018: 568), which suggests a basic meaning ‘crooked’ vel sim. In Slavic, all forms show a final *-t* that has been argued to originate in a nominal form **k^(w)loik-t-ieh₂-* (Derksen 2008: 224). In that case, the verbal forms reflecting PSl. **klěštiti* must have been back-formed after, e.g., **pustiti*, **puščō* (ESSJ X: 23). In view of the semantics of the verb, i.e., ‘to castrate; to squeeze’, a denominational origin from a noun **klěšča* ‘pincer’ seems quite plausible.

Although formally comparable, the semantics of the Balto-Slavic and Sanskrit roots are not close enough to make this etymology compelling. It should be noted that the Balto-Slavic forms would also be compatible with **kleis-* or **kleis-* (with depalatalization). The forms could alternatively be compared to Skt. *śreṣ-* / *śleṣ-* ‘to cling, stick to’, YAv. *srišāiti* ‘to stitch together’ (LEW: 273; see Cheung 2007: 355 for additional Iranian cognates), which perhaps provide a better fit semantically than Skt. *kleś-* ‘to trouble, torment’. The root **kleis-* is likely derived from **klei-* ‘to lean’ (EWAia II: 671; LIV: 333) with an *s*-extension (desiderative?) constituting a possible shared innovation of Indo-Slavic.

3.4.25. **k^(w)o(n)Hd-* ‘to bite’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Uncertain (Armenian)	Doubtful	Rejected	Root

Indo-Aryan: Skt. *khādati* ‘to chew, bite, eat, digest’

Iranian: Parth. *x’z* ‘to devour’; MoP *xāyīdan* ‘to chew, gnaw, eat’; Bal. *khāδ-* ‘to chew’; Khot. *khāś-* ‘to eat, drink’

Baltic: Lith. *kąsti*, *kánda* ‘to bite’; Latv. *kuōst*, *kuōžu* ‘to bite’

Slavic: OCS *kqsati*, *kqsaju* ‘to bite’; Ru. *kusát*, *kusáju* ‘to bite’; Pol. *kśać*, *kśam* ‘to bite’; SCr. *kúsati*, *kusáju* ‘to eat with a spoon’

Schmidt (1872: 47) listed this root as an Indo-Slavic isogloss. However, the etymology has been rejected in some more recent works (e.g., EWAia I: 451–52) and there are formal problems and possible additional cognates that must be addressed.

For Proto-Indo-Iranian, a root **kHaHd-* must be reconstructed, based on the consistent aspiration and length of the root vowel. It is often assumed that the aspiration is secondary from zero-grade forms of an original root **k^(w)ehzd-* (cf. LIV: 344), but the details remain unclear.¹⁴⁷ Parth. *x'z* 'to devour' appears to show a root extension **-s-*, likely originally a suffix (Cheung 2007: 445). Arm. *xacanem* 'to bite, sting', which is incompatible with final **-d-*, can be explained similarly, and reflects an *s*-aorist according to Martirosyan (2010: 324 with lit.).¹⁴⁸ However, the closeness to the Parthian form could also point to an Iranian borrowing, especially given the productivity of *-s-* < **-ske/o-* in Iranian.

The Balto-Slavic situation is complicated. Baltic points to **kon(H)d-*, a form that could reflect a generalized nasal present stem (Derksen 2015: 232). Smoczyński (2018: 502) dates this development to post-Proto-Baltic times, but since the nasal is also found in Slavic it is likely Proto-Balto-Slavic. Slavic **kqsati* thus corresponds in vocalism and nasal quality to Baltic, but the root ends in **-s-*. This is reminiscent of the Parthian and Armenian forms, but due to the nasal **kqsati* cannot be an Iranian borrowing. Perhaps these forms are all better derived from an old sigmatic aorist.

Even if the potential Armenian cognate is left out of consideration, the Indo-Iranian and Balto-Slavic forms cannot easily be united under one reconstruction. The aspirated anlaut in Indo-Iranian normally corresponds to Slavic **x-*, but it is difficult to exclude that the aspiration (i.e., **kH-*) is secondary in Indo-Iranian. The *o*-grade vocalism of Balto-Slavic cannot be excluded for Indo-Iranian, but would be unexpected from a morphological point of view. One could assume that the Indo-Iranian forms derive from **knHd-*, which would explain the consistent lengthened grade vocalism, but this makes the origin of the aspiration all the more obscure.

¹⁴⁷ LIV refers to the zero-grade *khid-*, which is attested for the homonymous, but likely etymologically unrelated Skt. *khād-* 'to strike, press'. However, based on the short root vowel in the Iranian cognates, e.g., YAv. *vīxaδ-* 'to beat (the earth) apart' (Cheung 2007: 439), this root most likely reflects PIIr. *kHad-*. The *vrddhi* vocalism in Skt. (JB) *s*-aorist 3pl. *akhātsur* and 3sg.perf. *cahāda* is then entirely regular from **ē* and **o*, respectively, and need not be attributed to a laryngeal. The aspirated *kh-* in the zero-grade *khid-* < **kHd-* may thus be analogical from the full grade **kHad-*. The regular outcome of **kHd-* would likely have been **čid-* or **kid-*, since laryngeal vocalization in initial syllables (PIIr.) predates laryngeal aspiration (Indo-Aryan). Consequently, a zero-grade **k^(w)h₂d-* is an unlikely model of analogy for the aspirate in Skt. *khād-* 'to chew, bite, eat, digest'.

¹⁴⁸ However, Skt. (JB) 3pl.aor. *akhātsur* cannot be used as evidence for an *s*-aorist to this root, as it belongs to the root *khād-/khid-* 'to strike, press' (EWAia II: 452), and might in any case be a secondary formation within Sanskrit (Narten 1964: 105–6).

3.4.26. **k^w(o)r-no-* ‘deaf, with mutilated ears’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	Semantics

Indo-Aryan: Skt. *kārṇa-* m. ‘ear’, *karná-* adj. ‘long-eared, with a defect on the ears’

Iranian: YAv. *karəna-* m./adj. ‘ear; deaf’; MiP Pahl. *karr*, Man. *kr*, *qr* adj. ‘deaf’; MoP *kar* adj. ‘deaf’; Sogd. BM *kṛn*, C *qrn* adj. ‘deaf’; Khot. *kārra-* adj. ‘deaf’; Psht. *kuṇ* adj. ‘deaf’; Wakh. *kṛn* ‘with mutilated ears (of sheep)’

Baltic: Lith. *kuřčias*, *kuřlas* adj. ‘deaf’; Latv. *kuřns*, *kūrls*, *kuřls* adj. ‘deaf’

Slavic: CS *krěnъ* adj. ‘mutilated (with ears slit or cropped)’; Ru. (dial.) *kornój* adj. ‘stocky, thickset’; SCr. *křn* adj. ‘broken off, dented, knocked out (teeth), maimed’, *křnja* adj. ‘crop-eared, snub-nosed, toothless’; RuCS *črěnъ* m. ‘handle’

Arntz (1933: 49) lists the above words as an Indo-Slavic isogloss.¹⁴⁹ However, the attested formations are not identical.

Within Indo-Iranian (EWAia I: 314–15; AirWb.: 455), **kārṇa-* ‘ear’ seems to be primary, from which a possessive adjective **karná-* ‘having defective ears’ is derived (cf. Skt. *śroná-* ‘lame’ << ‘with bad hips’ ~ *śroni-* f. ‘hip’). Given the cognates in Indo-Aryan and Iranian, both the base and the derivative can be reconstructed for Proto-Indo-Iranian. Synchronically, the etymology of **kārṇa-* ‘ear’ is obscure.

In Baltic, there is a host of forms (LEW: 314–15).¹⁵⁰ Lith. *kuřčias* is derived from the synonymous Lith. *kuřtas* ‘deaf’, which synchronically looks like a derivative from Lith. *kūrti* ‘to light a fire; to build’. However, it can hardly have been derived within Baltic, given the semantics.¹⁵¹ The *l*-adjective is likely a Baltic innovation. Latv. *kuřns* corresponds to CS *krěnъ* which may be reconstructed as PBSl. **kurno-* (Derksen 2015: 540–41). In the various Slavic languages, the meaning is not restricted to ‘ears’, but refers to various kinds of mutilation or defects (Vasmer I: 628–29). Nevertheless, since the oldest meaning refers to ‘ears’, this may be due to semantic widening.

On the one hand, PIIr. **kārṇa-* ‘ear’, **karná-* ‘deaf, having defective ears’ vs. PBSl. **kurno-* ‘deaf, with mutilated ears’ share the suffix **-no-* and similar semantics, but on the other hand, the root ablaut is divergent, which precludes a direct comparison. A possible bridge between the branches may be found in RuCS *črěnъ* m. ‘handle’ (Arntz 1933: 36; see further Vasmer III: 321–22). If RuCS *črěnъ* goes back to an Indo-Slavic formation **k^we/or-n-*, this may have meant ‘handle’ and referred to ‘ear’ metaphorically (whence Skt. *kārṇa-*).¹⁵² From **k^we/or-n-* ‘handle, ear’, possessive adjectives may then have arisen through thematization of this athematic *n*-stem.

¹⁴⁹ Lat. *curtus* ‘mutilated, circumcised; imperfect’ is according to de Vaan (2008: 158) derived from **(s)ker-* ‘to shave, scratch off’ rather than **k^wer-* ‘to cut’. In any case, it does not bear any specific similarity in morphology or semantics to the Indo-Iranian and Balto-Slavic forms, and is better kept apart.

¹⁵⁰ The accentuation of the various Balto-Slavic forms is a complicated issue that I will not go into here. The original accentuation of the Baltic forms cannot be determined (see Derksen 1996: 226).

¹⁵¹ Lith. *kuřsti* ‘to become deaf’ is doubtless denominative (Smoczyński 2018: 641).

¹⁵² Not here Welsh *caru* ‘sword pommel’, which requires a palatal or a plain velar (*pace* Vasmer III: 322; Pedersen 1909: 61).

An alternative scenario is proposed by Fraenkel (1962: 315), in which the adjective **k^w(o)r-no-* ‘with mutilated ears’, shared by Indo-Iranian and Balto-Slavic, is primary. PIr. **kárna-* ‘ear’ would then be a back-formation from **karná-* ‘deaf, having defective ears’. This seems more plausible than assuming an Indo-Slavic noun **k^we/or-n-* ‘handle, ear’, but still does not offer an explanation for the divergent root ablaut in **k^w(o)r-no-* ‘with mutilated ears’. Ultimately, the isogloss is uncertain.

3.4.27. **med^hu-h₁ed-* ‘honey-eater’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *madh(u)vád-* adj. ‘honey-eating’

Iranian: –

Baltic: –

Slavic: OCS *medvědb* m. ‘bear’; Ru. *medvéd’* m. ‘bear’; Pol. (dial.) *miedźwiedź* m. ‘bear’; SCr. *mědvjed* m. ‘bear’

The Slavic word for ‘bear’ (Vasmer II: 110; Derksen 2008: 306) corresponds formally to Skt. *madh(u)vád-* ‘honey-eating’. This is listed as an isogloss by Arntz (1933: 51).

The Slavic compound must be archaic since it preserves consonantal **u* (Dickenmann 1934: 144). Furthermore, it was no longer transparent for Slavic speakers, since new compounds like SCr. *mědojěd* ‘honey-eater’ were formed (see further ESSJ XVIII: 55).

Skt. *madh(u)vád-* ‘honey-eating’ (in German translation usually “Süßes essend”, cf. KEWA II: 571) is attested in the tetrasyllabic nom.pl. *madh_uvádaḥ* (RV I.164.22a), which describes a (metaphorical) group of birds. According to Dickenmann (1934: 144; accepted by LEW: 207 and AiGr. I: Nachträge 207,8), the compound cannot be old, because *-uv-* is irregular after a light syllable (according to Sievers’ Law). However, while **-uHá-* should regularly have yielded Skt. *-vá-* (cf. Kuiper 1987; Lubotsky 1997), this contraction could easily have been restored at the morpheme boundary between *madhu-* and *ád-*. Another Vedic compound *mádhvarṇas-* ‘having sweet waves’ (RV I.62.6d) is also tetrasyllabic.

While the form of Skt. *madh(u)vád-* ‘honey-eating’ does not preclude an archaic formation, it is difficult to exclude that it was created within Sanskrit, given the many parallels of *-ád-* ‘eating’ as a second member in compounds, including cases containing non-Indo-European words, e.g., *karambhāḍ-* ‘porridge-eating’.

3.4.28. **m(e)itH-u-* ‘opposed’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Uncertain (Italic)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *míthū* adv. ‘wrongly, opposed, falsely’, *mithuyā́* adv. ‘falsely’

Iranian: –

Baltic: –

Slavic: ORu. *mitusъ* adv. ‘opposite one another, criss-cross’; Pol. (dial.) *mituś* adv. ‘across, criss-cross, the other way round’; Cz. (dial.) *mitvy* adv. ‘in turn, alternately’

A connection between the above adverbs is advocated in Slavic etymological sources (Vasmer II: 139; Derksen 2008: 319), but the precise relationship is not elaborated upon. Based on Skt. *míthū* and Cz. *mitvy* (which shows that a *u*-stem is attested in Slavic), a *u*-stem **m(e)itH-u-* may be reconstructed. Here, I leave Skt. *mithuṇá-* adj. ‘opposed, paired’, YAv. *miθβana-*, *miθβara-* adj. ‘paired’ out of consideration, since they seem to reflect a heteroclitic *uer-/uen*-stem rather than an original *u*-stem (for a different view cf. EWAia II: 355). The same applies to Skt. *mithás* adv. ‘contrary, variably, mutually’, YAv. *miθō* adv. ‘wrongly, falsely’, and OCS *mitě* adv. ‘in turn, alternately’.

Lat. *mūtuus* adj. ‘on loan, reciprocal’ has been compared to the *u*-stem of Indo-Iranian and Slavic (Vasmer II: 139; Derksen 2008: 319), but the connection is uncertain. In Latin, old *u*-stem adjectives were normally not thematicized but turned into *i*-stems, cf. Lat. *gravis* ‘heavy’ < **graus* < **g^wreh₂-u-* and *lēvis* ‘smooth’ < **lēius* < **leh₁i-u-* (Fischer 1982; Schrijver 1991: 283–84). This rather suggests that *mūtuus* derives from an unattested *o*-stem **mūto-* ‘object of change’, which also was the basis for the denominal *mūtāre* ‘to exchange, replace’. The stem **mūto-* may be derived from **mei-* ‘to change’ or *meitH-* (de Vaan 2008: 399).

Only if the Latin adjective is explained in this way (which is not necessarily justifiable) can **m(e)itH-u-* be considered as a compelling Indo-Slavic isogloss. The lexicalization of adverbs from various case forms of this stem was likely an independent development in the branches, given that the root ablaut does not match.

3.4.29. **nis-tio-* adj. ‘(being) outside’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Plausible	^N Derivation

Indo-Aryan: Skt. *nīṣṭya-* adj. ‘external, foreign, strange’

Iranian: Orm. *pa-néṣṭa* ‘outside, on the outside’¹⁵³

Baltic: –

Slavic: OCS *nīštъ* adj. ‘poor, destitute’; Ru. *nīščij* adj. ‘destitute, poverty-stricken’; SCr. *nīšt* adj. ‘poor, destitute’

An etymological connection between these Sanskrit and Slavic words has long been assumed (Vasmer II: 222; EWAia II: 48), the problem being that the Slavic long vowel in **nīs-* does not match Skt. *nīṣ-* (Derksen 2008: 353). It is possible that the long vowel was introduced by analogy to OCS *nizъ* ‘down, below’, but the Slavic form could also be an independent derivative *vis-à-vis* Skt. *nīṣṭya-*.

The suffix **-tio-* forms adjectives from adverbs, cf. Skt. *nītya-* ‘own, native, lasting’ ~ Goth. *niþjis* ‘relative’, and **nis-tio-* is thus transparently built on **nis-*, reflected by Skt. *nīṣ* ‘out, forth, away, over, without, not-’, OAv. *nīš* ‘out’. While the derivational pattern is likely old, it is important to note that **nis-* is not attested outside Indo-Iranian. If the Slavic word is related, we may either assume it has undergone a shift from ‘being outside’ >> ‘being outside the community and therefore destitute’ >> ‘poor, destitute’, or that **nis-tio-* originally had a broader scope of meaning, derived from the range of meanings of **nis-*, i.e., ‘out; without’ etc., after which Indo-Aryan and Slavic specified the semantics in different directions.

3.4.30. **pr(H)k-* ‘rib, side, flank, chest’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	Root

Indo-Aryan: Skt. *pārśu-* f. ‘rib; curved knife, sickle’, *pārśvá-* n. ‘flank, side’, *prṣṭí-* f. ‘rib’

Iranian: YAv. *pərəsu.masah-* ‘having the size of a rib’; MiP Pahl. *pahlūg* ‘side, rib’; MoP *pahlū* ‘side, rib’; Sogd. M *prs* ‘hour, side’, BM *prs’kh* ‘side, rib’ Khot. *pālsu-* ‘rib, side; spoke of a wheel’; Oss. *fars* ‘side’, I *færsk* / D *færskæ* ‘rib’; Psht. *puṣṭāy* f. ‘rib’; Wakh. *pyrs* ‘rib’

Baltic: Lith. *pīršys* f.pl. ‘chest (of a horse)’

Slavic: OCS *prъsi* f.pl. ‘chest, bosom’; Ru. (arch.) *pěrsi* f.pl. ‘breast, bosom’; Pol. *piers* f. ‘breast, chest’; SCr. *pъsi* f.pl. ‘breast, chest’

Meillet (1926: 173) and Arntz (1933: 39) list the Indo-Iranian and Balto-Slavic forms as an isogloss. In Indo-Iranian, a *u*-stem is widely attested, alongside a thematicized *u*-stem (Skt.

¹⁵³ Orm. *pa-néṣṭa* ‘outside, on the outside’ has also been derived from **nīš-tara-*, cf. YAv. *nīštara-* ‘external’, but Efimov’s (2011: 294) reconstruction **nīštiā-* is more plausible, since Ormuri seems to preserve final *-r* after apocope, cf. *cār* ‘four’ < Plr. **čaθuāra-*.

pārsvá- ~ Oss. *fars*, see Cheung 2002: 182). Skt. *prṣṭí-* seems to be a *ti*-derivative from the same root (EWAia II: 165). As Balto-Slavic has an *i*-stem, **pr(H)k-* is classified as a potential root isogloss.

As noted by Derksen (2015: 358), the Balto-Slavic forms point to a laryngeal in the root, which is incompatible with Indo-Iranian. Unless the acute intonation is secondary, the etymology cannot be maintained. In that case, one may instead compare the Indo-Iranian words to OE *fealg* f. ‘felly’ < PGm. **felgō-*, although this may rather belong with Ru. *póloz* m. ‘runner, skid’, Sln. *plâz* m. ‘plough sole; strip’ (cf. Kroonen 2013: 134).

3.4.31. **(s)ker-men-* ‘hide, skin’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Uncertain (Germanic)	Compelling	Possible	^N Derivation Semantics

Indo-Aryan: Skt. *cārman-* n. ‘hide, (flayed) skin’

Iranian: YAv. *carəman-* n. ‘hide, leather’; OP *carman* ‘leather’; MiP Pahl. *čarm*, Man. *crm* ‘skin, hide, leather’; MoP *čarm* ‘leather’; Sogd. BS *crm* ‘skin, leather’; Khot. *tcārman-* ‘hide’; Oss. *carm* ‘hide, skin’; Psht. *carmán* f. ‘skin, hide’

Baltic: OPr. *kērmens* m. ‘body’

Slavic: –

Arntz (1933: 48–49) listed the Indo-Iranian-Prussian correspondence as an isogloss. OPr. *kērmens* has been remade into an *i*-stem, which is not unparalleled, cf. *emmens* ‘name’ (Mažiulis 2012).

However, OHG *scirm* ‘screen’ < PGm. **skermi-* has often been connected, which would render the isogloss non-exclusive. The word has been taken as a *men*-derivative from **(s)ker-* ‘to cut’. Boutkan & Siebinga (2005: s.v. *skerma*) reject this etymology on semantic grounds, but a development from ‘what has been cut’ >> ‘hide, skin’ >> ‘protective shield’ does not seem implausible. Although the derivational path from **(s)ker-men-* to PGm. **skermi-* is not entirely clear, the *e*-grade in the root points to a *men*-stem rather than a *mo*-stem, in which case *o*-grade would be expected (cf. PGm. **sauma-* ‘seam’ << **siujan-* ‘to sew’).

Alternatively, **(s)ker-men-* has been connected to Hitt. *karije/a-^{zi}* ‘to cover’ (Puhvel 1997: 82). In this case, the semantics of Indo-Slavic **(s)ker-men-* ‘hide, skin’ would constitute an innovation *vis-à-vis* PGm. **skermi-* ‘protective shield’. However, as the traditional etymological connection to **(s)ker-* ‘to cut’ seems equally plausible, the isogloss is uncertain.

3.4.32. **sm-b^heh₂*- ‘assembly, social gathering, meeting, company’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *sabhā́*- f. ‘assembly, social gathering, meeting, company’

Iranian: (YAv. *habāspa*- m. ‘PN; having horses in the *habā*- (?)’)

Baltic: –

Slavic: SerbCS *sebrǎ* m. ‘associate, partner, (type of) farmer’ ORu. *sjabrǎ* m. ‘neighbour, companion’

Skt. *sabhā́*- ‘assembly, social gathering, meeting, company’ has often been compared to Goth. *sibja*¹⁵⁴ ‘kinship’ (IEW: 882–84), but already Edgerton (1914) suggested that it must derive from **sm*- ‘together’ + **b^heh₂*- ‘to speak’, lit. ‘colloquium’. According to Rau (1957: 75–81), the *sabhā́*- was a hall where the societal elite engaged in games of dice, banquets etc. However, Mayrhofer’s assertion (EWAia II: 701) that the original meaning of *sabhā́*- was ‘hall, big room’ rather than ‘assembly’ leaves the word without an Indo-European etymology. It seems more plausible that the meaning ‘hall’ is secondary after the function of this building, i.e., as a place of social gatherings (cf. Falk 1986: 85). In Sanskrit, the root *bhā*- means ‘to shine’, but an additional meaning ‘to speak’ must be reconstructed for Proto-Indo-European based on Gr. φημί ‘to say’ etc. (LIV: 69), which is continued in Skt. *bhánati* ‘to speak’ < **b^h-n-h₂-e/o-*. This indicates that *sabhā́*- cannot have been derived within Sanskrit but must at least be Proto-Indo-Iranian, even if the name YAv. *habāspa*- does not belong here.

SerbCS *sebrǎ*, ORu. *sjabrǎ* reflect Proto-Slavic **sębrǎ* (cf. Vasmer III: 62).¹⁵⁵ The form has been explained as a nasalized variant of ***sebrǎ* and connected to Goth. *sibja* f. ‘kinship’ (IEW: 882–84), or as related to Proto-Slavic **sěmьja* ‘household, family, servants’ (Vaillant IV: 638) < **koī-m-*, cf. Goth. *haims* f. ‘village’. The former scenario should be given up, as the assumed nasalization is *ad hoc*. The latter scenario requires the assumption of a stem **ki-m-ro-* (thus Rozwadowski 1928), since **koī-m-* cannot give Proto-Slavic **ę* < PBSl. **im* (or **em*). A weakness of this scenario is that all attested forms of **koī-m-* have full grade in the root. However, since the stem variation within Balto-Slavic (cf. Lith. *šeimà*, *šeimė* f. ‘family, household’, Latv. *sàime* f. ‘members of a household, (extended) family’) points to an athematic stem, it cannot be excluded that zero-grade forms existed in the original paradigm. As for the required epenthesis **mr* > **mbr*, the only example Vaillant (I: 95) mentions is **sębrǎ* itself.

An alternative etymology would be to derive PSl. **sębrǎ* from the same compound as Skt. *sabhā́*-, i.e., **sm-b^heh₂*- ‘assembly, social gathering, meeting, company’. From this, **sm-b^hh₂-ro-* ‘one of the assembly, community etc.’ would have been created, which

¹⁵⁴ Proto-Germanic **sebjō*- ‘kinship’ is derived from a form of the reflexive pronoun (see Kroonen 2013: 429).

¹⁵⁵ Similar forms in neighbouring languages, e.g., Lith. *sėbras*, (dial.) *sėbras* ‘companion’; Latv. *sēbrs* ‘neighbour’, Alb. *sembër* ‘peasants using the same pair of oxen’, Modern Greek σέμπρος, σέμπρός ‘type of farmer’, Hungarian *cimbora* ‘associate, partner’, Romanian *sîmbră* ‘community’, are all Slavic borrowings. Differently on Lith. *sėbras*, cf. Kalima (1940).

ultimately gave the attested Slavic forms. This would directly account for the *e*-vowel. Although the suffix **-ro-* primarily forms primary adjectives, it could also be used in denominal derivation, cf. Skt. *támisrā-* f. ‘dark night’ ~ Lat. *tenebrae* f.pl. ‘darkness’ < **temH-s-ro-*. A possible parallel to **sm-b^hh₂-ro-* is **men(s)-d^hh₁-ro-* ‘wise’,¹⁵⁶ if derived from the corresponding compounded root noun **men(s)-d^heh₁-* ‘wisdom’. The underlying stem **sm-b^heh₂-* would then be an Indo-Slavic isogloss. Even if the formation would be an archaism, the shared semantic development from an original ‘colloquium’ >> ‘assembly, social gathering, meeting, company’ could be a shared innovation. However, since the competing etymology **kí-m-ro-* cannot be rejected, this remains uncertain.

3.4.33. **sor(H)-to-* ‘red(-faced)’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: –

Iranian: YAv. *harəta-* adj. ‘sick with a certain illness (?)’

Baltic: Lith. *saĩtas* adj. ‘bright-red, ginger’; Latv. *saĩts* adj. ‘red-faced’

Slavic: –

This etymology is supported in various etymological dictionaries (e.g., LEW: 764; EWAia II: 726).¹⁵⁷ According to Derksen (1996: 90), the intonation of Latv. *saĩts* adj. ‘red-faced’ and the presumably related Lith. *sárkanas* adj. ‘pink, ruddy; transparent’ represents the original Baltic situation. In any case, YAv. *harəta-* would be compatible with both **sor-to-* and **sorH-to-*. However, the etymology must be considered doubtful, because the meaning of the Avestan word is unclear. It is not at all certain that *harəta-* describes an illness causing redness in the face, as the etymology presupposes. Besides *harəta-* ‘sick with a certain illness’, there is a homophonous *harəta-* ‘well-fed, fat’, which may or may not be related.

3.4.34. **srom-o-* ‘lame’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *srāmá-* adj. ‘lame’, *srāma-* m. ‘paralysis, illness’

Iranian: –¹⁵⁸

Baltic: –

Slavic: OCS *xromъ* adj. ‘lame’; Ru. *xromój* adj. ‘lame’; Pol. *chromy* adj. ‘lame, mutilated’; SCr. *hròm* adj. ‘lame’

¹⁵⁶ Cf. Skt. *médhira-* ‘wise’, YAv. *mązdra-* ‘wise’, OHG *muntar* ‘perky, vivid’, Lith. *mandriùs* ‘cheerful, lively’, OCS *mądrъ* ‘wise’.

¹⁵⁷ Skt. *sārāṅga-* ‘variegated, spotted’ is also included, but the connection is uncertain.

¹⁵⁸ OAv. *rəma-*, *rāma-* adj. ‘spraining’ is unclear.

Arntz (1933: 38) listed this adjective as an Indo-Slavic isogloss. Indeed, the etymology is attractive from a semantic perspective, but it is formally problematic since the Slavic anlaut **xr-* does not regularly reflect **sr-* (cf. OCS *struja* ‘stream’ < **srou-ieh₂-*). ESSJ (VIII: 102) suggests that *xr-* derives from **skr-* and connects Slavic **xròmь* ‘lame’ to Ger. *Schramme* f. ‘scratch’ (as well as ON *skráma* f. ‘wound, scratch’). However, this is semantically less attractive. Although *ad hoc*, it is possible to assume that the Slavic **x-* is from **s-* due to a sporadic sound change after the phonologization of the RUKI rule, cf. Old Polish *smura* ‘cloud’ ~ *chmura* ‘id.’ (Collins 2018: 1433), which would allow the connection to Skt. *srāmá-* to be maintained as an Indo-Slavic isogloss. However, this is uncertain. In any case, it cannot be excluded that the stem is an archaism, as the root **srem-* is not attested in other (verbal) formations.

3.4.35. **telp-* ‘to make room’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	Root

Indo-Aryan: Skt. *tálpa-* m. ‘bed, retreat, divan, martial bed’

Iranian: –

Baltic: Lith. *tĩlpti*, *tel̃pa* ‘to take place’, *talpà* f. ‘sufficient space, volume’; Latv. *tĩlpt*, *telpu* ‘to enter, take place’

Slavic: OCS *tl̃pa* f. ‘heap, drove’

Arntz (1933: 46) listed Skt. *tálpa-* ‘bed, retreat, divan, martial bed’ next to Lith. *talpà* ‘sufficient space, volume’ as a root isogloss (cf. EWAia I: 638). OIr. *-tella* ‘to take place’ has been adduced (cf. LIV: 623), but is rather to be analysed as *to-* ‘to’ + *ell-* ‘to go, set in motion’ (Pedersen 1913: 511). ToB *tsālp-* ‘to be free of, pass away, escape; be delivered’ and *tālp-* ‘to purge’ have also been connected (Adams 2013: 315, 807), but this is semantically unconvincing. However, the same may be said for Skt. *tálpa-*. While a connection to the Balto-Slavic root is possible, it is not obvious, and its isolation within Indo-Iranian makes it even more uncertain.

3.4.36. **t(H)ong^h-eie/o-* ‘to pull’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^v Derivation

Indo-Aryan: –

Iranian: YAv. *θanjaiieiti* ‘to pull, steer (a wagon)’; MiP Man. *’hynz-* ‘to draw (up)’; Sogd. B *ðync-* ‘to pull out’; Khot. *thamj-* ‘to pull’

Baltic: (Lith. *tĩngti*, *-sta* ‘to become slow’, *tĩngùs* ‘lazy’)

Slavic: CS *rastěšti*, *rastěgo* ‘to tear apart’; Ru. *tjagát*, *tjagáju* ‘to pull’, *túžit*, *túžu* ‘to strain’; Pol. *teżyć*, *teżę* ‘to strain, tense’;

Meillet (1926: 172) and Arntz (1933: 39) list the root of YAv. *θaṇjaiieiti* (AirWb.: 784–85) and Ru. *tjagát* ‘etc.’ (Derksen 2008: 493) as an Indo-Slavic isogloss. However, these cannot be separated from ToB *tänk-* ‘to check, stop, hinder’ (Adams 2013: 306). The root is further attested in, e.g., ON *þungr* ‘heavy’ < **þungu-*, which is directly comparable to Lith. *tingùs* ‘lazy’ and OCS *těžъкъ* ‘heavy’.

The reconstruction of the root is disputed. LIV: 657 gives **t^heng^h-*, arguing that the aspirated tenuis arose from **sd^heng^h-* via Siebs’ Law and subsequent loss of *s*-mobile. The alternative reconstruction **th₂eng^h-* is dismissed because of the lack of laryngeal colouring in Germanic **þinhsłō-* ‘drawbar, cartpole’. However, irrespective of the fact that **þinhsłō-* rather reflects **tenk-*, there is no need to reconstruct **h₂* specifically, since **h₁* would also have triggered Iranian fricativization of **t*. Hoffmann (1974) explained the Iranian anlaut as resulting from metathesis of **teng^h-* > **t^heng-*, which is followed by Kümmel (2011–2024 s.v. **teng^h-*). Similarly, Cheung (2007: 391–92) reconstructs **teng^h-*, arguing that the root must be a variant of **ten-* ‘to stretch’.

Exclusive to Iranian and Slavic is the *ie/o*-stem reflected in Ru. *túžit* ‘to strain’, Pol. *teżyć* ‘to strain, tense’ (Vasmer III: 148) and YAv. *θaṇjaiieiti*, Khot. *thamj-* ‘to pull’ (*j* < **jaja-*), which is a possible shared innovation, although the stems may have been formed independently.

3.4.37. **(t)plh₁-* ‘fort’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Uncertain (Greek)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *púr* f., gen.sg. *púras* ‘fort, palisade’

Iranian: –

Baltic: Lith. *pilis* f. ‘fort, castle’; Latv. *pils* f. ‘fort, castle’

Slavic: –

The Sanskrit and Baltic words are related to Gr. π(τ)όλις f. ‘citadel, fort’ (EWAia II: 145; LEW: 590–91). However, the Greek stem differs from Skt. *púr* in ablaut (*o-* vs. zero-grade) and stem class (*i*-stem vs. root noun). Lith. *pilis* shares the zero-grade root with Sanskrit but the *i*-stem with Greek. The Baltic *i*-stem could be secondary, since most old *i*-stems show full grade in the root in Baltic, e.g., Lith. *avìs* f. ~ Skt. *ávi-* m./f. ‘sheep’, whereas *i*-stems with zero-grade are generally derived from root nouns, e.g., Lith. *upìs* f. ‘river’ ~ Skt. *áp-* f. ‘water’, Lith. *pušìs* f. ‘pine’ ~ East Lith. nom.pl. *pùšes* (NIL: 553; Derksen 2015: 374). However, it is difficult to exclude that all three branches reflect the same original paradigm.

3.4.38. *uelk^(w)- ‘to pull, drag’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	Root Semantics

Indo-Aryan: –

Iranian: YAv. *vərəca-* ‘to pull, draw, tow’, *aipi-varəc-* ‘to pull on (clothing)’; OKhot. *valj-* ‘to move’

Baltic: Lith. *vilkti*, *velka* ‘to drag’, *vilkėti*, *vilki* ‘to be dressed, wear’; Latv. *vilkt*, *vēlku* ‘to drag; put on (clothes)’

Slavic: OCS *vlěšti*, *vlěko* ‘to drag’; Ru. *volóč’*, *volokú* ‘to drag’; Pol. *wlec*, *włokę* ‘to drag’; SCr. *vúci*, *vúcēm* ‘to drag’

A root **h₂uelk^(w)*- has traditionally been identified as the base of Gr. ἄλοξ, αὔλαξ ‘furrow’ and the verb reflected in Iranian and Balto-Slavic (AirWb.: 1366–67; LEW: 1253; Derksen 2015: 504), but the irregular variation in Greek suggests non-Indo-European origin (Beekes 2010: 73–74). Lat. *sulcus* m. ‘furrow’, Alb. *helq* ‘to draw’, and Gr. ἔλκω ‘to draw’ < **selk*- are unrelated (pace LEW; cf. de Vaan 2008: 598). The root **uelk^(w)*- is thus a potential Indo-Slavic isogloss.

However, the analysis of the Iranian material is uncertain. The two Avestan attestations (*vərəca-* vs. *aipi-varəc-*) look formally divergent, but it cannot be excluded that *-varəc-* stands for older *-vərəc-*. As for the semantics, Yt 17.19 *nōiṭ mąm ... fraorciṇta* (< **pra-určanta*) may plausibly be translated as ‘they [the gods] cannot (forcibly) drag me [Angra Mainyu] off’, especially given the following paragraph Yt 17.20 *raēkō mē haca aṇhā zəmaṭ vaṇhō kərənaoiti* ‘he [Zaraθuštra] makes the leaving of this earth better for me’. However, this cannot be considered certain. The other attestation N 77.2 *yezi tarasca aiβiiāṇhana aipi.varəcanti ratufriiō* is part of an instruction on how to put on the sacred girdle, which is difficult to interpret. Waag (1941: 94–95) translates ‘wenn sie [den Nackenschutz] unter der [angelegten] Gürtelschnur hindurch herausziehen, so stellen sie die Ratu’s zufrieden’¹⁵⁹, which makes several unverifiable assumptions. Kotwal & Kreyenbroek (2009: 48–49) emend the text to *yezi tarasca aiβiiāṇhana aiβi.varzənti ratufriiō* and translate ‘if they handle the girdle to the side (of this place), they satisfy the Ratus’. The emendation is unjustified, however, since *varz-* ‘to do, work’ otherwise has a *ia*-present *vərəziia-*. Ultimately, *aipi-varəc-* can be translated to ‘to put on (clothes)’ (cf. Latv. *vilkt*, to drag; put on (clothes)), but since the context is obscure this cannot be considered certain. The possible Khotanese cognate *valj-* ‘to move’ (Bailey 1979: 378) or ‘to go astray, be deceived’ (Emmerick 1968: 120) does not help, as the semantics in any case cannot be demonstrated to be closer to the Balto-Slavic verbs.¹⁶⁰

Given the problems surrounding the Iranian material, the isogloss is classified as uncertain.

¹⁵⁹ ‘If they pull [the neck guard] out through under the [donned] girdle, then they satisfy the Ratus’.

¹⁶⁰ If related, its meaning may have developed secondarily from ‘to pull, drag’, cf. Nw. *dra* ‘to pull; go, travel’.

3.4.39. **u(e)nH-* ‘forest’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation Root

Indo-Aryan: Skt. *ván-* n. (?) ‘tree, wood’, *vána-* n. ‘tree, wood, forest’

Iranian: YAv. *vanā-* f. ‘tree’; MiP Pahl. *wan* ‘tree, stock, stem’; MoP *bun* ‘log, root’; Sogd. *wn-* ‘tree’; Psht. *wána*, *wúna* f. ‘tree’

Baltic: –

Slavic: OCS *вънъ* adv./prep. ‘outside, away, out of’; Ru. *von* adv. ‘away, off’, *vne* prep. ‘outside, out of’; Cz. *ven* adv. ‘away, out’; SCr. *văn* adv./prep. ‘out, out of, except, besides’

Arntz (1933: 56) listed the words as an Indo-Slavic isogloss. The etymology (supported by Vasmer I: 225; and Derksen 2008: 531) is based on the idea that the Slavic adverb/preposition is derived from a fossilized case form of a noun corresponding to Skt. *ván-* ‘tree, wood’. While possible, the scenario is difficult to substantiate,¹⁶¹ as there is no trace of the original lexeme in Balto-Slavic. On the formal side, one would have to assume a secondary zero-grade **un-* instead of expected **vin-*.¹⁶² Even if the etymology is correct, the deeper origin of **u(e)nH-* ‘forest’ is unclear.

3.4.40. **uiċ-poti-* ‘lord of the settlement’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *viśpāti-* m. ‘lord of the tribe, chief of the settlement, ruler’, *viśpātnī-* f. ‘ruler’

Iranian: YAv. *vīspaiti-* m. ‘chieftain’

Baltic: Lith. *viēšpatis*, *viēšpats* m. ‘lord’, OLith. *viēšpatni* ‘hostess, lady of the house’; OPr. acc.sg.f. *waispattin* ‘mistress’

Slavic: –

Schmidt (1872: 50) and Arntz (1933: 50) listed the compound **uiċ-poti-* as an Indo-Slavic isogloss. The attested forms are not entirely formally equivalent, however. As evidenced by OPr. *waispattin* ‘mistress’, the first member of the Baltic compound has *o*-grade in the root, as opposed to Indo-Iranian **uiċ-*. According to Knobloch (1980: 190), the Baltic full grade was secondarily introduced to prevent **viś-pati* to be parsed as ‘lord of all’. This scenario is not very attractive, since Lith. *višas* and Latv. *viss* ‘all’ both contain *s*, not **ś*.¹⁶³ Schindler (1972: 32) argued that Baltic **uaiš-* reflects an archaic genitive **uoik-s* << **ueik-s* with

¹⁶¹ Lith. *laukan*, *laukañ* adv. ‘outside, into the field, away’, derived from *laukas* m. ‘area of open land, field’, is a possible parallel (Vasmer I: 225).

¹⁶² A zero-grade **vun* could be attributed to the existence of an *o*-grade form **uonH-* elsewhere in the paradigm.

¹⁶³ The etymology of Lith. *višas* and Latv. *viss* ‘all’ is disputed (cf. 3.4.41), and it is not certain that it reflects a root **uiċ-*, as presupposed in Knobloch’s scenario.

analogical *o*-grade from the strong stem of a static root noun. However, it cannot be proven that the first member of the Baltic compound is a genitive as opposed to the bare stem. Larsson (2007) instead suggests that the first member should be identified with Lith. *viėšis* m. ‘guest’, Latv. *viėsis*, *viėss* m. ‘guest’, since stem vowels of immobile nouns are regularly lost in compounds, e.g., Lith. *viėšnamis* ‘guest house’. Based on these considerations, a direct comparison of the Baltic and Indo-Iranian compounds is doubtful.

3.4.41. **uisu(-)* ‘in every direction’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *vīśu-* ‘in every direction’

Iranian: YAv. *vīžuuānc-* ‘facing in different directions’

Baltic: Lith. *visas* adj. ‘all’; Latv. *viss* adj. ‘all’; OPr. *wissa-* adj. ‘all’

Slavic: OCS *vsb* adj. ‘all’; Ru. *ves’* adj. ‘all’, ORu. (Novg.) *vxu* adj. ‘all’; OPol. *wszy* adj. ‘all’; SCr. *sāv* adj. ‘all’

Schmidt (1872: 50) and Arntz (1933: 50) listed Skt. *vīśva-* ‘all’, Av. *vīspa-* ‘all’ and the Balto-Slavic words for ‘all’ as an isogloss, although the latter also included Skt. *vīśu-* as a cognate. However, given ORu. *vxu* (without progressive palatalization) (cf. Vasmer I: 192; Derksen 2008: 540), the comparison with Indo-Iranian **uićuo-* must be abandoned. Even if the suffix **-uo-* is analogical from **sarua-* (Skt. *sārva-* ‘whole, all’), **ć* cannot be reconciled with Balto-Slavic **s*.

Regardless of whether **uik(u)o-* or **uiso-* is reconstructed, the *-s-* of Lith. *visas* ‘all’ is irregular. Derksen (2008: 540; 2015: 507), following a suggestion by Kortlandt, argued that this irregularity can be explained under the assumption that Balto-Slavic **uiso-* derives from **uisu*, a form he compares with Skt. *vīśu-*, argued to reflect a locative plural of **h₁ui-* ‘apart’. The regular Balto-Slavic outcome **uišu* would then have been replaced by **uisu* in Baltic when the allomorph loc.pl. *-su* was generalized. Subsequently, an *o*-stem adjective would have been derived from this locative plural form. A similar scenario may be envisioned for Slavic **vbsb* << **vbxb* (*-xb* being the regular loc.pl. ending). While Kortlandt’s scenario is ingenious, it requires two potentially problematic assumptions: 1) **uišu* was still analysable as a loc.pl. in Proto-Baltic, and 2) Baltic and Slavic independently derived adjective stems from loc.pl. **uisu*.

Assuming that Kortlandt’s scenario is correct, we may proceed to evaluate **uisu(-)* as a potential Indo-Slavic isogloss. In Indo-Iranian, **uišu-* has been lexicalized, i.e., is no longer analysable as a locative plural of **(H)ui-*. The same cannot be said for Proto-Balto-Slavic **uišu*, however, since Kortlandt’s scenario requires the form to have been analysable as a locative plural at the time when the allomorphs of this case ending were levelled, which happened independently in Baltic and Slavic. The potential isogloss is thus reduced to the preservation of a locative plural form of **h₁ui-* ‘apart’, rather than the innovation of an adjective stem.

3.4.42. *ulp-i- ‘(wild)cat’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Possible	Semantics

Indo-Aryan: –

Iranian: MiP Pahl. *gurbag* ‘cat’; MoP *gorbe* ‘cat’

Baltic: Lith. *vilpišys* m. ‘wildcat’

Slavic: –

Arntz (1933: 57) takes MiP *gurbag* ‘cat’ < **urpaka-* and Lith. *vilpišys* m. ‘wildcat’ for ‘(wild)cat’ as a semantic isogloss *vis-à-vis* Lat. *volpēs* f. ‘fox’. However, given that the words have different suffixes, the origin of which are not fully clear, especially in the case of Lith. *vilpišys* (cf. de Vaan 2000; Palmér et al. 2021), the etymology is uncertain. Even if it is correct, it is difficult to exclude that ‘(wild)cat’ is the more archaic meaning.

3.5. Rejected isoglosses

3.5.1. *b^hag-o- ‘god’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation Semantics

Indo-Aryan: Skt. *bhāga-* m. ‘wealth, share’

Iranian: OAv. *baga-* m., YAv. *baya-* m. ‘god’; OP *baga-* m. ‘god’

Baltic: –

Slavic: OCS *bogъ* m. ‘god’, *u-bogъ* adj. ‘poor’; Ru. *bog* m. ‘god’; Pol. *bóg* m. ‘god’; SCr. *bôg* m. ‘god’

Schmidt (1872: 46) lists the Iranian and Slavic words for ‘god’, on the one hand, and the Sanskrit and Slavic words for ‘wealth’, on the other, as isoglosses. Meillet (1926: 168) argues against a Slavic borrowing from Iranian because he does not believe that a word of such cultural significance would be borrowed (cf. also Arntz 1933: 48). However, this claim is contradicted by Erzya (Mordvin) *paz*, *pas* ‘god’ < **pakas*, which is a loanword from Indo-Iranian (Holopainen 2019: 171). Meillet furthermore argues that OCS *u-bogъ* ‘poor’ and *bogatъ* ‘rich’ prove that OCS *bogъ* ‘god’ is inherited and underwent a shared semantic shift with Iranian from ‘wealth’ >> ‘god’. However, the absence of Winter’s Law renders the equation of OCS *bogъ* and OAv. *baga-* formally irregular, and the Slavic material is better explained as borrowings from Iranian.

3.5.2. **b^heb^hr-u-* ‘beaver’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Uncertain (Germanic)	Doubtful	Rejected	^N Derivation

Indo-Aryan: Skt. *babhrú-* adj. ‘brown’, Mitanni Indo-Aryan *babru-nmu* ‘epithet of horses’

Iranian: YAv. *baβra-* m. ‘beaver’; MiP Pahl. *babrag* ‘beaver’

Baltic: Lith. *bēbras*, *bebrūs* m. ‘beaver’; Latv. *bēbrs* m. ‘beaver’; OPr. *bebrus* ‘beaver’

Slavic: CS *bebrъ* ‘beaver’; Ru. *bobr* m. ‘beaver’; Pol. *bóbr* m. ‘beaver’; SCr. *däbar* m. ‘beaver’

Traditionally, a *u*-stem **b^heb^hr-u-* has been reconstructed for Skt. *babhrú-* ‘brown’, Lith. *bebrūs* ‘beaver’, OIr. *Bibar* ‘PN’, and ON *bjórr* m. ‘beaver’ (IEW: 136–37). Matasović (2009: 59) reconstructs **b^heb^hru-* for Celtic, but the only non-onomastic evidence is OBret. *beuer* ‘beaver’ and Old Cornish *befer* ‘beaver’, which may be loans from Vulgar Latin and Old English, respectively (cf. Delamarre 2003: 69), and in any case do not prove a *u*-stem. The only evidence for a *u*-stem in Celtic consists of OIr. *Bibar*, but as a name it is etymologically ambiguous, since its meaning cannot be determined. ON *bjórr* shows *u*-breaking, but is synchronically an *o*-stem. It can hardly derive from a *u*-stem, as these were generally retained in North Germanic, but rather reflects PGm. **bebura-* (de Vries 1977: 40; Kroonen 2013: 56), which looks like a thematicization of **b^he-b^hṛ-*. Kümmel (2004) argues that Germanic must have inherited a *u*-stem on account of OE *beber*, *bebor* ‘beaver’, whose epenthetic vowel in the second syllable points to a disyllabic preform (i.e., **b^heb^hr-u-*). However, it is difficult to exclude that Old English reflects PGm. **bebra-*, originating as an alternative thematicization of Pre-Proto-Germanic **b^he-b^hṛ-*. Thus, only Indo-Aryan and Baltic securely attest *u*-stems.

However, the equation of Skt. *babhrú-* and Lith. *bebrūs* is problematic. The Sanskrit word does not mean ‘beaver’ but ‘brown’ (EWAia II: 210). Since colour adjectives are frequently *u*-stems, *babhrú-* may be analysed as a derivative of PIIr. **b^hab^hra-* ‘beaver’, which is attested in Iranian. Since there were beavers in Iran and Afghanistan in ancient times, but not in India (Nowak & Paradiso 1983: 560), it is not unexpected that Sanskrit would have lost the ‘beaver’ word. The Baltic words (cf. LEW: 38) all mean ‘beaver’ and it is difficult to imagine what would have motivated a shift from ‘brown’ >> ‘beaver’. Given the great variation within Balto-Slavic, where not only *o*- and *u*-stems are attested, but also forms with different root vowels, e.g., Lith. *bābras*, CS *bobrъ*, ORu. *bēbrъ*, the *u*-stems Lith. *bebrūs* and OPr. *bebrus* appear to have been cherry-picked to fit the idea of a PIE *u*-stem, which, upon closer examination, cannot be supported. It is possible that the Baltic *u*-stem arose through reanalysis of case forms of **b^heb^hro-* with *u*-vocalism in the ending.

As stated above, PGm. **bebura-* implies an original athematic stem **b^he-b^hṛ-*, which was thematicized after the Germanic development **ṛ > *ur*. Therefore, a case could be made for viewing YAv. *baβra-* and the Balto-Slavic *o*-stems as a shared innovation *vis-à-vis* the athematic stem. Lat. *fiber* m. ‘beaver’ is synchronically an *o*-stem, too, but requires the assumption of irregular raising of **e > i*. Since a variant *feber* is also attested, de Vaan

(2008: 217) maintains that raising cannot be excluded. An alternative explanation, however, is that the variation between *fiber* and *feber* goes back to an alternation in the reduplicating syllable in Indo-European, i.e., **b^{hi}-b^{her}-* / **b^{he}-b^{hr}-*. In this scenario, the thematization would have occurred within Italic. Nevertheless, the *o*-stem in Iranian and Balto-Slavic is not necessarily significant, since it could have developed independently, just like it eventually did in Germanic and Italic.

3.5.3. **b^{he}Hg^h-* ‘to press, stick’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	Root

Indo-Aryan: Skt. *bāhate* ‘to press’

Iranian: –

Baltic: Latv. *bāzt*, *-žu* ‘to stick, stuff’

Slavic: –

In older literature, this etymology, which is a potential Indo-Slavic isogloss, is sometimes supported (e.g., LEW: 38). However, Skt. *bāhate* ‘to press’ is attested in late texts where *b/v* are not consistently differentiated (KEWA II: 427–28). It is best understood as a variant of *vāhate* or *bādhate* ‘to press’, and the etymology should be rejected.

3.5.4. **b^{he}h₂d^h-* ‘to push, press’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Germanic)	Compelling	Possible	Root

Indo-Aryan: Skt. *bādhá-* m. ‘distress’, *bādhate* ‘to push, press, trouble, oppose, repel’

Iranian: (YAv. *auui.bāda-* ‘due to pressure’)¹⁶⁴

Baltic: Lith. *bósti*, *-ta* ‘to bother, bore, be repugnant’, *bóstis*, *bódžiasi* ‘to be bored with, be disgusted by’, (*bèsti*, *bēda* ‘to stick, drive (into), dig’, *bēdà* f. ‘misfortune, trouble, guilt’, *bādas* m. ‘hunger’; Latv. *best*, *bēdu* ‘to dig, bury’, *bēda* f. ‘care, sorrow, grief’, *bads* m. ‘hunger’)

Slavic: (OCS *bosti*, *bodq* ‘to stab’, *bēda* f. ‘distress, need, necessity’; Ru. *bedá* f. ‘misfortune, trouble’; Pol. *bieda* f. ‘poverty, misery’; SCr. *bijèda* f. ‘grief, misfortune’)

Arntz (1933: 35) listed Skt. *bībhatsate* ‘to be disgusted’ and Lith. *bóstis* ‘to be bored with, be disgusted by’ as an Indo-Slavic isogloss (cf. also LEW: 29). However, although the roots of these stems may be compared, there are other potential cognates within as well as outside of Balto-Slavic and Indo-Iranian that must be taken into account.

The compound Skt. *jñu-bādh-* adj. ‘bending the knees’ has been compared with ON *kné-beðr* ‘hassock’, OS *kneo-beda* ‘prayer’. ON *beðr* m. ‘bed’ is cognate to Eng. *bed* etc. (de Vries 1977: 29) and the Germanic compound may thus be analysed as ‘knee-bed’. This

¹⁶⁴ The analysis of this word is unclear; it might be unrelated to Skt. *bādh-* ‘to push, press, trouble, oppose, repel’ (contra Hoffmann & Narten 1989: 82).

is rather different from Skt. *jñu-bādh-*, which seems to mean ‘knee-bending’. Although the etymology of ON *beðr* m. ‘bed’ is uncertain, it is difficult to imagine that it would be derived from a root meaning ‘to push, bend’.

Skt. *bādh-* ‘to press (etc.)’ has long *ā* in most forms; whenever this is not the case, it is likely due to secondary shortening (Gotō 1996: 216). It has been compared to the root of OCS *běda* ‘distress, need, necessity’, Lith. *bėdà* ‘misfortune, trouble, guilt’, and Latv. *bēda* ‘care, sorrow, grief’, where the non-acute accentuation points to **b^hēd^h-* rather than **b^heh₁d^h-* (pace LIV: 68), cf. also Lith. *bādas* ‘hunger’ and Latv. *bads* ‘hunger’. However, within Slavic, OCS *běda* is close to OCS *běditi* ‘to force, persuade’, which in turn cannot be separated from Goth. *baidjan* ‘to force’, ON *beiða* ‘to ask, request’ (Derksen 2008: 39). Although it has been suggested, ON *beiða* (causative to *bíða* ‘to wait for; suffer’) cannot be related to ON *biðja* ‘to ask, beg, pray’ < **b^hed^h-* (?), but must go back to **b^heid^h-* ‘to force’ (Kroonen 2013: 57). Since **b^heid^h-* can produce OCS *běditi* ‘to force, persuade’ and *běda*, but not Lith. *bėdà*, Latv. *bēda*, the Baltic words have been taken as loanwords from Slavic. This is rejected by Būga (RR I: 345–46), however, as Slavic **ě* is normally borrowed as Lith. *ie*. Based on this, Derksen (2008: 39) suggests that OCS *běditi* and *běda* reflect a merger of two roots **b^heid^h-* and **b^hēd^h-*.

Irrespective of whether Lith. *bėdà*, Latv. *bēda* are borrowed from Slavic or not, there is secure evidence for a root **b^hed^hh₂-*¹⁶⁵ ‘to stab, dig’ in Balto-Slavic, e.g., Lith. *bėsti* ‘to stick, drive (into), dig’, Latv. *best* ‘to dig, bury’, OCS *bosti* ‘to stab’, which is related to Lat. *fodiō* ‘to dig’, Hitt. *padda-i* ‘to dig’, ToA *pātar* ‘they ploughed’. It would be semantically possible to derive nominal forms such as OCS *běda* ‘distress, need, necessity’ and Lith. *bādas* ‘hunger’ from **b^hed^hh₂-* ‘to stab, dig’ (as in ‘something that stabs at you’). Furthermore, it would be tempting to include Skt. *bādh-* in this etymon. However, the long *-ā-* cannot be explained from **b^hod^hh₂-*, since the laryngeal would have blocked Brugmann’s Law.

Thus, Skt. *bādh-* seems impossible to reconcile with **b^hed^hh₂-*, from which all above-mentioned Slavic forms and most Baltic forms can be derived (marked with brackets in the section header). We may instead return to Arntz’ original suggestion, namely a direct comparison with Lith. *bóstis* ‘to be bored with, be disgusted by’, *bósti* ‘to bother, bore, be repugnant’. Like Skt. *bādh-*, Lith. *bósti* also seems incompatible with **b^hed^hh₂-* and rather points to **b^heh₂d^h-*. Also, semantically, there is *a priori* no reason to connect Lith. *bósti* with *bėsti*, *bādas* ‘hunger’ etc. Although it is not a direct semantic match to Skt. *bādhate* ‘to push, press, trouble, oppose, repel’, Lith. *bósti* ‘to bother, bore, be repugnant’ may well have developed from ‘to push away, trouble, repel’, cf. also Lith. *bodūs* ‘boring, annoying, unpleasant, disgusting’. A hint at the same development is found in Skt. *bādhá-* m. ‘distress’ and Skt. *bībhatsate* ‘to be disgusted’ (< ‘to wish to push away’).

Besides Indo-Iranian and Baltic, however, a root **b^heh₂d^h-* ‘to push, press’ seems to be attested in OS *under-badon* ‘to oppress’ and Nw. *bada* ‘to press’ < PGm. **badōn-*, if from zero-grade **b^hh₂d^h-*. As such, the isogloss is non-exclusive.

¹⁶⁵ With final **-h₂* due to Hittite (Kloekhorst 2008: 655).

3.5.5. **b^hoh₂u-eie/o-* ‘to cause to be, linger (?)’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Rejected	^V Derivation

Indo-Aryan: Skt. *pārā bhāvayati* ‘to make perish’ (AV+)

Iranian: –

Baltic: –

Slavic: Ru. (dial.) *bávit* ‘to linger’; Pol. *bawić, bawię* ‘to amuse, be, abide’; SCr. *băviti se* ‘to engage in’

Arntz (1933: 50) argues that the causatives to **b^heh₂u-* ‘to become’, attested in Sanskrit and Slavic, constitute an Indo-Slavic isogloss. However, the distant semantics suggests independent innovations. The fact that Skt. *pārā bhāvayati* ‘to make perish’ seems to be a productive causative to *pārā bhavati* ‘to perish’ (Jamison 1983: 116) is consistent with this conclusion.

3.5.6. **b^h(o)lg^{(w)h-}* ‘good; a deity (?)’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	Root

Indo-Aryan: Skt. *bṛhas-pāti-* m. ‘name of a God’

Iranian: YAv. *bərəj-* f. ‘rite, ritual praise’, *bərəjiia-* m. ‘a god who augments the crop-droves’

Baltic: –

Slavic: OCS *blago* n. ‘(the) good’; ORu. *bologo* n. ‘(the) good’; Pol. *blago* n. ‘good, happiness’ SCr. *blăgo* n. ‘wealth, money, cattle’

Arntz (1933: 39) listed this as an Indo-Slavic isogloss (see further EWAia II: 232–33; Derksen 2008: 51). Although formally possible, the etymology is not semantically compelling and should be rejected. YAv. *bərəj-* f. ‘rite, ritual praise’ may be connected to a root **b^herg^{h-}* ‘to consider, observe’ (LIV: 79–80).

3.5.7. **b^hong-o/eh₂-* ‘wave’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Rejected	^N Derivation

Indo-Aryan: Skt. *bhaṅgá-* m./adj. ‘breach; breaking, splitting; wave (Ragh.)’

Iranian: –

Baltic: Lith. *bangà* f. ‘wave, (dial.) multitude’; Latv. *bañga* f. ‘wave, downpour, multitude, cloud’

Slavic: –

Schmidt (1872: 45) and Arntz (1933: 48) listed this as an Indo-Slavic isogloss. However, the Indo-Aryan and Baltic formations are not identical (*o*-stem vs. *eh₂*-stem). Furthermore, the etymology is semantically unconvincing, since the meaning ‘wave’ is late and clearly secondary within Sanskrit. I therefore follow Derksen (2015: 81), who treats the words as independent innovations.

3.5.8. **b^houd^h-eie/o-* ‘to make awaken’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Rejected	^N Derivation

Indo-Aryan: Skt. *bodhāyati* ‘to make awaken’

Iranian: YAv. *baodāiieiiti* ‘to reveal, make perceive’

Baltic: Lith. *báudyti, báudo* ‘to incite, instigate’; Latv. *bàudīt, bàudu* ‘to incite, instigate’; OPr. *etbaudinons* pf.ptc.act ‘awakened’

Slavic: OCS *ubuditi, ubužďo* ‘to awaken’; Ru. *budít’, bužú* ‘to awaken, arouse’; Pol. *budzić, budze* ‘to awaken, arouse’; SCR. *búđiti, búđīm* ‘to awaken, arouse’

Arntz (1933: 50) listed this as an isogloss. For the Indo-Iranian forms, see EWAia II: 234. The Baltic verb is metatonical and could be secondary, although Derksen does not consider causatives in *-yti* to be productive (Derksen 1996: 346; 2015: 83). LIV: 83 considers only the Slavic and Indo-Iranian forms to be old. However, the Sanskrit and Avestan causatives have different meanings and are probably independent post-Proto-Indo-Iranian formations from Skt. *búđhyate* ‘to wake’ and YAv. *būđiia-* ‘to perceive’, respectively. The Sanskrit and Slavic forms are semantically comparable, but as the suffix is productive in both branches, this is not necessarily significant.

A case could be made that the meaning ‘to become awake’ of **b^heud^h-*, which only appears in Indo-Iranian and Balto-Slavic, is a semantic isogloss. However, the root may have meant both ‘to become attentive’ and ‘to become awake’ in Proto-Indo-European, since the difference is rather trivial.

3.5.9. **b^hruH-no-* / **b^hrouH-neh₂-* ‘embryo; scale’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Rejected	^N Derivation

Indo-Aryan: Skt. *bhrūṇá-* n. ‘brood, embryo’

Iranian: –

Baltic: Lith. *briaunà* f. ‘edge, cornice, crust of bread, haft’; Latv. *braūna* f. ‘flake, scale, abandoned skin or shell, caul, entrails’

Slavic: –

EWAia (II: 283) tentatively supports a connection between the Sanskrit and Latvian words. Derksen (2015: 528) connects Latv. *braūna* to Skt. *bhrūṇá-* and OIr. *brú* f. ‘abdomen, belly, bowels, interior’, but the latter is rather from **brus-on-* (Matasović 2009: 81);

comparable to Ru. *brjúxo* n. ‘belly’ (Derksen 2008: 63). Without the Celtic cognate, the Sanskrit and Latvian words constitute a possible Indo-Slavic isogloss.

Yet, the etymology is formally and semantically problematic. Both Derksen (2015: 528) and Fraenkel (LEW: 57) separate Latv. *braĩna* from Lith. *briaunà*, which has possible cognates in Celtic and Germanic (cf. Derksen 2015: 100). In my opinion, the connection within Baltic is not so easily dismissible. Within Lithuanian, *briaunà* has several secondary meanings that seem to derive from ‘edge’, such as ‘crust’, which is quite close to the Latvian semantics. On the other hand, the semantic connection between the Baltic and Sanskrit forms is quite weak. Moreover, Skt. *bhrũná-* and Latv. *braĩna* do not reflect the same ablaut grade in the root, nor the same stem suffix, implying that they can only be indirectly compared through the (rather speculative) assumption of an athematic stem **b^hrrouH-n-*. Ultimately, the etymology is best rejected.

3.5.10. **deķm-t-* ‘decade’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Greek)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *daśát-* f. ‘decade’

Iranian: –

Baltic: Lith. *dešimtĩs*, *dėšim(t)s* ‘ten’; Latv. *desmit* ‘ten’; OPr. *dessempts*, *dessimpts*, *dessimton* ‘ten’

Slavic: OCS *desęb* ‘ten’; Ru. *dėsjat* ‘ten’; Pol. *dziesięć* ‘ten’; SCr. *dēsēt* ‘ten’

Indo-Aryan (EWAia I: 709) and Balto-Slavic (LEW: 91; Derksen 2008: 100) share a *t*-stem derived from the PIE cardinal **deķm* ‘ten’. Dialectal evidence shows that the Baltic word is declined as a consonant stem (Zinkevičius 1966: 325), and clearly distinct from the ordinal *dešimĩtas* ‘tenth’, cf. PGM. **tehunb/dan-* ‘tenth’.

However, there are possible cognates in other branches. According to Demiraj (1997: 162–63), Alb. *dhjētē* ‘ten’ is either from **deķm-* or **deķm-t-*. However, since the numerals 6–10 in Albanian are identical to the ordinals (e.g., (i) *dhjetē* ‘tenth’, *gjashtë* ‘six’ ~ (i) *gjashtë* ‘sixth’), *dhjētē* ‘ten’ may be secondary. The irregular anlaut *dh-*, which likely originates in, e.g., *tridhjetē* ‘thirty’, favours this conclusion. A more promising potential cognate is Gr. *δεκάς*, *-άδος* f. ‘decade’ (Beekes 2010: 311–312). Olsen (1989) suggested that **t* was regularly voiced after an accented nasal in Greek (see already Brugmann 1892: 368; also van Beek 2017). This proposal is attractive, as *δεκάς* is identical to Skt. *daśát-* in gender and meaning, and because it offers an explanation of the suffix *-άδ-* which is otherwise obscure.

3.5.11. **deks(i)-no-* ‘right’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Celtic)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *dākṣiṇa-* adj. ‘right, southern’

Iranian: YAv. *dašina-* adj. ‘right, southern’; MiP Pahl. *dašn*, Man. *dšn* ‘right hand’

Baltic: Lith. *dėšinas* adj. ‘right’

Slavic: OCS *desnъ* adj. ‘right’; ORu. *desnъ* adj. ‘right’; SCr. *děsnī* adj. ‘right’

It has long been recognized that the Indo-European languages display a variety of derivatives from **deks(i)-* ‘right’ and that Indo-Iranian (EWAia I: 690; AirWb.: 703–04) and Balto-Slavic (LEW: 91; Derksen 2008: 100–01; Derksen 2015: 124) share a *no*-stem (Schmidt 1872: 46; Arntz 1933: 46; Porzig 1954: 166). However, *pace* Brugmann (1892: 130), there is no evidence that OCS *desnъ* contained an **i* (Beekes 1994: 87), which rather reflects **deks-no-*, unlike Baltic and Indo-Iranian, which reflect **deks-i-no-*.

Greek (Gr. δεξιός ‘right’), Celtic (OIr. *dess* ‘right, south’, Gaul. *Dex(s)iua* ‘a theonym’), and Germanic (OHG *zeso* ‘right’, Goth. *taihswa* f. ‘right hand’) reflect **deks(i)-uo-*, whereas Lat. *dexter* ‘right’ shows the suffix *-tero-. The origin of Alb. *djathtë* ‘right’ is open to several interpretations. Since **ks* regularly becomes Alb. *sh*, e.g., *gjashtë* < **sueks-*, *djathtë* cannot regularly reflect **deks(i)-uo-* or **deks(i)-no-*. Taken at face value, it looks like **dek-to-*. According to Kortlandt (1987: 221), *djathtë* ultimately derives from **deks-no-*, but replaced the *n*-suffix by *-të* after **s* had regularly been lost before **n*, thus explaining the outcome *th*. However, Albanian also has *djathë* ‘right (side)’ and the adverb *ndjath* ‘right’ (Orel 1998: 67–68; Demiraj 1997: 137), which according to Demiraj can be taken as reflexes of an adverbial **deks*. After the regular loss of word final *-s, the productive suffix *-të* was added at some point in the history of Albanian. Although the exact scenario is difficult to determine, there is no secure evidence for a *no*-suffix in Albanian.

Clear extra-Indo-Slavic evidence for **deksi-no-* comes from Celtic, however. As noted by Stifter (2015: 98), OIr. *deisen* ‘right hand’ looks like a cognate of Skt. *dākṣiṇa-* etc., but has been left out of most etymological works. Based on this, **deks(i)-no-* is rejected as an Indo-Slavic isogloss.

Even if the Old Irish form could be explained away, OCS *desnъ* does not entirely correspond to Baltic and Indo-Iranian, as noted above. This could be interpreted as evidence that the addition of a suffix *-no- occurred independently in the separate branches. However, a similar variation is present in the reflexes of the *uo*-stem, where Celtic has forms both with and without **i*, and Greek and Germanic have forms with and without **i*, respectively. Since there seems to be a fundamental variation, reconstructable for Proto-Indo-European, between **deks* and **deksi* (perhaps originally different case forms of a stem **dek-s-*), it is possible that this variation was carried over into the secondary derivatives. Therefore, **deks(i)-no-* constitutes a possible innovation in Celtic, Balto-Slavic, and Indo-Iranian, which may or may not have been created independently.

3.5.12. **dlh₁g^h-ó-* ‘long’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Albanian)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *dīrghá-* adj. ‘long’

Iranian: OAv. *darəga-* adj. ‘long’

Baltic: Lith. *ilgas* adj. ‘long’; Latv. *ilgs* adj. ‘long (of time)’

Slavic: OCS *dlъgъ* adj. ‘long’; Ru. *dólgij* adj. ‘long’; Pol. *dlugi* adj. ‘long’; SCr. *dùg* adj. ‘long’

The Indo-Iranian and Slavic forms are regular from **dlh₁g^h-ó-* (EWAia I: 728–29; AirWb.: 693; Derksen 2008: 133). Arntz (1933: 47) listed this stem as an Indo-Slavic isogloss. A reasonable explanation of the Baltic situation, although *ad hoc*, is that **dilgas* was first assimilated to **gilgas*, after which the initial **g-* was dissimilated against the following **-g-*.¹⁶⁶ According to Meillet (1926: 172), **dlh₁g^h-ó-* is uniquely Indo-Slavic. Other branches seem to reflect slightly different forms, albeit probably ultimately related: Gr. *δολιχός* ‘long’,¹⁶⁷ *εν-δελεχής* ‘continuous’ < **delh₁g^h-*; Goth. *tulgus* ‘firm’ < **dlh₁g^h-u-* (Kroonen 2013: 525); Hitt. *talugai-* ‘long’ < **dolug^h-i-* (Kloekhorst 2008: 820); ON *langr* ‘long’, Lat. *longus* ‘long’ < **dlong^h-o-*. Goth. *tulgus* is the only form where the root corresponds exactly to **dlh₁g^h-ó-*. These adjectives are possibly independent derivations from a Proto-Indo-European nominal stem.

However, it is not possible to reject Alb. *gjatë*, (older) *glatë* ‘long’ as an extra-Indo-Slavic reflex of **dlh₁g^h-ó-*. The Albanian form has been compared to Lat. *longus* and ON *langr* < **dlong^h-o-*, but would then require a zero-grade **dlngh^h-o-*, which is otherwise unattested. As such, the most economic reconstruction is **dlh₁g^h-ó-*, with secondary suffixation by *-të* (Demiraj 1997: 185). Thus, **dlh₁g^h-ó-* cannot be maintained as an Indo-Slavic isogloss, but is a possible innovation shared with Albanian.

3.5.13. **drǵh-* ‘fetter; belt, strap, girdle’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	Root

Indo-Aryan: (Skt. *prāṇa-dṛgh-* adj. ‘making the breath firm’ (KS+))¹⁶⁸

Iranian: OAv. *dərəz-* f. ‘fetter’

Baltic: Lith. *diržas* m. ‘belt, strap’; Latv. *dirža* f. ‘leather girdle’

Slavic: –

¹⁶⁶ It might appear easier to postulate a change **dl-* > **gl-*, parallel to **tl* > Baltic *kl*, but the relative chronology is impossible: since Slavic preserves initial **d-*, the change to **gl-* would have to postdate Proto-Balto-Slavic, at which time the **l* would already have been vocalized to **il*.

¹⁶⁷ Gr. *δολιχός* must reflect an *o*-grade in the root since **dlh₁g^h-* would regularly give PGr. **dlēkh-*. The **i* of the root is then perhaps best understood as a raised **e* < **h₁*, although it could also be compared to the unexplained **u* of Hitt. *talugai-* < **dolug^h-i-*.

¹⁶⁸ The apparent Sanskrit root noun can hardly be directly compared to OAv. *dərəz-* given the divergent semantics.

Arntz (1933: 48) listed the Avestan and Baltic words as an isogloss. The etymology is complicated, as OAv. *dərəz-* has been connected to several different Indo-European roots (EWAia I: 707, with lit.). Starting instead with the Baltic evidence, it is possible that the broken tone of Latv. *dirža* necessitates a reconstruction **d^(h)rg̃-* or **d^(h)rHg^h-* (Derksen 2015: 133). As for OAv. *dərəz-*, it is most closely related within Iranian to YAv. *darəzaiieiti* ‘to attach, fetter’, Khot. *dals-* ‘to make firm, fasten, load’ etc. (cf. Cheung 2007: 62–64). These verbal forms in turn correspond to Skt. *ḍṛh-* ‘to fix, make firm’, which excludes a reconstruction with **-ḡ* or **-Hg^h*, making a connection to Baltic doubtful. Even if the Baltic and Indo-Iranian roots could be connected, Goth. *tulgus* ‘firm’, *tulgjan* ‘to make firm, fortify’ presents a closer semantic match to Indo-Iranian (Szemerényi 1979: 109–10); Lat. *indulgeō* ‘to be indulgent’ may also belong here (de Vaan 2008: 302; LIV: 113). This makes a reconstruction **delḡ^h-*, from which Lith. *diržas* etc. could never be derived, more probable for Indo-Iranian **darj^h-*.

3.5.14. **dr(H)-ueh₂-* ‘wild grass (?)’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Germanic, Celtic)	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *dūrvā-* f. ‘*Cynodon dactylon*, a grass’

Iranian: –

Baltic: Lith. *dirvā* f. ‘(arable) land, field’; Latv. *dirva* f. ‘(arable) land, field’

Slavic: Ru. *derėvnja* f. ‘village, (dial.) field, wasteland, ploughed field’

Skt. *dūrvā-* ‘*Cynodon dactylon*, a grass’ is usually compared to Du. *tarwe* ‘wheat’ < PGm. **terwō-* and Welsh *drewg* ‘darnel’, Bret. *draok*, *dreok* ‘id.’ < PCelt. **drāuā-*, which demand a laryngeal in the root. Conversely, the non-acute intonation of Lith. *dirvā* ‘(arable) land, field’ and the other Balto-Slavic forms point to a reconstruction without a laryngeal. However, Lubotsky (1997: 148) remarks that **-ǵu-* might regularly have yielded Skt. *-ū-*, as there are no other examples of this sequence. Even if this is the case, there is no compelling reason to reject the connection between Sanskrit, Germanic, and Celtic.

3.5.15. **d^he-d^hh₁-* ‘(sour) milk’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Albanian)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *dādhi*, gen.sg. *dadhnás* n. ‘sour milk’; Khow. *don* ‘ghee’

Iranian: –

Baltic: OPr. *dadān* n. ‘milk’, *ructandadan* n. ‘sour milk’

Slavic: –

This reduplicated stem is presented as an isogloss by Arntz (1933: 47). See further EWAia I: 693–94. However, Alb. *djathë* m. ‘cheese’ cannot be separated from the Indo-Aryan and Prussian words, although the irregular voiceless *-th-* is unclear (see Demiraj 1997: 135–36);

it may possibly be explained by generalization of a variant where the consonant is word-final.

The word is generally etymologized as a reduplicated stem from **d^heh₁(i)-* ‘to suck, suckle’. The reconstruction of the reduplication syllable is problematic, since Alb. *-ja-* points to **e*, whereas OPr. *-a-* *a priori* suggests an *o*. However, as Beekes (1987: 54) remarks, OPr. *dadān* could reflect earlier **dedān*, since OPr. *a* occasionally seems to correspond to East Baltic *e* (cf. Trautmann 1910: 104–105). A possible parallel of a change **e > OPr. a* is *nadele* ‘Sunday’ << Slavic **neděl’a*. Skt. *dādhi* is not informative, since Brugmann’s Law would have been blocked in the oblique stem *dadhn-*, but the vocalism is easiest explained from an **e*. Thus, there are no compelling arguments against reconstructing **d^he-* for all three forms.

The *i/n*-suffix of Sanskrit is not paralleled in either Old Prussian or Albanian. While the *n*-suffix in the weak stem may be an Indo-Iranian innovation (as argued by Beekes 1987) or an archaism lost in the other branches, the *i*-suffix of the strong stem probably reflects a vocalized laryngeal in nom.-acc.sg. **d^he-d^hh₁*. This reconstruction would also be consistent with the devoicing of final **d^h* in Albanian. In Old Prussian, the stem was thematized.

3.5.16. **d^heg^{wh}-e/o-* ‘to burn’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Albanian, Tocharian)	Compelling	Possible	^V Derivation

Indo-Aryan: Skt. *dāhati* ‘to burn (tr.)’

Iranian: YAv. *dažaiti*¹⁶⁹ ‘to burn (tr.)’; Khot. *dajs-* ‘to burn; to ripen’

Baltic: Lith. *dègti, dēga* ‘to burn, light’; Latv. *degt, dēgu* ‘to burn, light’

Slavic: OCS *žešti, žego* ‘to burn’; Ru. *žeč’, žgú* ‘to burn’; Pol. *żec, żgeć* ‘to burn’; SCr. *žèci, žèžēm* ‘to burn’

Schmidt (1872: 46) and Arntz (1933: 48) took this shared thematic present stem as an Indo-Slavic isogloss. However, Alb. *djeg* ‘to burn (tr.)’ belongs here as well (Demiraj 1997: 138–39), which makes the isogloss non-exclusive.

A further possible cognate is ToAB *tsäk-* ‘to burn’ (Adams 2013: 802). The anlaut *ts-* is complicated, however, as it seems to reflect **d-* rather than **d^h-*. This has been explained by assuming a Tocharian “Grassmann’s Law” (Winter 1962: 24). Yet, ToA *tpär*, ToB *tapre* ‘high’, if from **d^hub^hro-* ‘deep’, presents a strong counterexample. The connection must thus be considered uncertain.

¹⁶⁹ According to Martínez (1999: 130), YAv. *dažaiti* rather reflects a *ie/o*-present.

3.5.17. **d^heh₁i-* ‘to contemplate, behold, see’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Albanian)	Compelling	Possible	Root

Indo-Aryan: Skt. *dhī́-* f. ‘observation, vision, thought’, *dhayⁱ-* ‘to contemplate, behold, see’

Iranian: OAv., YAv. *daēnā-* f. ‘conception, view, religion’

Baltic: –

Slavic: OCS *divъ* m. ‘astonishment, amazement’; Ru. (dial.) *div* m. ‘miracle, astonishment’;

Pol. *dziw* m. ‘miracle’

While Meillet (1926: 168) acknowledges that the circumflex of the related adjective SCr. *dīvan* ‘wonderful, splendid’ excludes direct comparison of OCS *divъ* and Skt. *dhī́-*, he argues that the words are ultimately related (cf. also Arntz 1933: 46). Indeed, it seems likely that these stems, including Av. *daēnā-* f. ‘conception, view, religion’, are derived from the same root **d^heh₁i-* (cf. Kümmel 2020: 183).¹⁷⁰ This is possibly a variant of **d^heh₁-* ‘to put’, originating from a verbal *i*-stem, cf. Hitt. *daiⁱ-* / *ti-* ‘to lay, put, place’ (Lubotsky 2011: 122).

Gr. *σημα*, Dor. *σᾶμα* ‘sign, symbol, trait’ < **d^hieh₂-mn-* and *θαῦμα* ‘wonder, astonishment’ have been adduced as root cognates (see further Beekes 2010: 535, 1323), but as they require a different root structure, the connection is uncertain.

However, Alb. *di* ‘to know’ may well reflect **d^heh₁i-*, with a trivial semantic shift (Demiraj 1997: 132–33; LIV: 141–42). Thus, **d^heh₁i-* must be rejected as an Indo-Slavic isogloss.

3.5.18. **d^her-men-* ‘support; agreement’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Rejected	^N Derivation

Indo-Aryan: Skt. *dhárman-* n. ‘support, law’

Iranian: MiP Pahl. *darmān*, Man. *drm* ‘n’ ‘medicine, remedy, cure (?)’

Baltic: Lith. *dermẽ* f. ‘agreement, consensus, harmony, treaty’, *dernà* f. ‘id.’

Slavic: –

The etymology is supported by LEW: 83 but not by EWAia I: 780. Lat. *firmus* ‘firm, stable’ is likely a root cognate, but is an adjective and does not reflect a *men*-stem. Although the Indo-Iranian and Baltic forms are formally comparable, they seem to derive their semantics from their respective corresponding verbal stems: Skt. *dhārāya-* ‘to hold firm, support’ vs. Lith. *derėti* ‘to be suited, agree upon’. This indicates that the words are independent innovations.

¹⁷⁰ There is a discussion in the literature about the position of the laryngeal in Av. *daēnā-* and Skt. *dhī́-* (see EWAia I: 777 with lit.). I follow Narten (1986) and Lubotsky (1995: 214; 2011: 122), who reconstruct OAv. *daēnā-* < **daiH-ana-*, based on its trisyllabic scansion. Skt. *dhī́-* has a monosyllabic instr.sg. *dhyá*, which has been argued to reflect **d^hHi-aH*, but could just as well reflect **d^hiH-áH*.

3.5.19. **d^hoiH-neh₂*- ‘conception; song’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation

Indo-Aryan: –

Iranian: OAv., YAv. *daēnā*- f. ‘conception, view, religion’

Baltic: Lith. *dainà* f. ‘(secular) song’; Latv. *daĩņa* f. ‘(folk) song’

Slavic: –

The above words were listed as an isogloss by Schmidt (Schmidt 1872: 46) and Arntz (1933: 48). However, Av. *daēnā*- is trisyllabic and must reflect **daiHana*- or **daHiana*- (Narten 1986: 263; Lubotsky 1995: 214; 2011: 122), which is formally incompatible with Baltic **d^hoiH-neh₂*-. Semantically, the connection is not compelling.

3.5.20. **ǵorh₂-eie/o-* ‘to make old, let ripen’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Rejected	^V Derivation

Indo-Aryan: Skt. *jaráyati* ‘to make age’

Iranian: –

Baltic: –

Slavic: OCS *szzori* 3sg.aor. ‘ripened (tr.)’; Ru. (dial.) *zorít* ‘to make (berries) ripen by spreading (them) on a mat’; OCz. *szoríti* ‘to ripen (tr.)’; Sln. *zoríti*, *zorím* ‘to ripen (tr.)’

Although Arntz’s (1933: 48) comparison of Skt. *jíryati* ‘to grow old, obsolete’ to OCS *szžrěti* ‘to ripen’ cannot be maintained on formal grounds (cf. LIV: 165), both branches have potentially cognate causative formations. However, a closer look at the attested forms shows that this can hardly be the case. The short root vowel of Skt. *jaráyati* ‘to make age’ need not be due to the root-final laryngeal, but rather indicates that the stem is a secondary formation (within Indo-Aryan) to *járati* ‘to make age’ with the same meaning (Jamison 1983: 154, cf. *várdhati* vs. *vardháyati*). In Slavic, the causative may have been formed at any point, as a contrastive formation to the intransitive OCS *szžrěti* ‘to ripen’.

3.5.21. **ǵ^hrem-e/o-* ‘to murmur; to thunder, rage’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^V Derivation

Indo-Aryan: –

Iranian: YAv. *gramənt-* ptc. ‘raging’; Sogd. S *ʾyr’n-* ‘to get angry’; Psht. *ɣar-éğ* : -ed- ‘to roar, thunder’

Baltic: Lith. (dial.) *gramėti*, *grāma*, *grumėti*, *grūma* ‘to dash, fall, sink’; Latv. *gremt*, -ju ‘to murmur’

Slavic: –

Iranian and Latvian have been argued to share a thematic present from a root **g^hrem-* (LIV: 204). The root is also reflected in ON *gramr* ‘angry’, OE *grimman* ‘to rage, roar; rush’, OCS *gromъ* m. ‘thunder’, *grъмѣti* ‘to thunder’, Gr. *χρόμος* m. ‘kind of noise’. Based on the attested semantics, the root may be onomatopoeic in origin, with Iranian and Germanic sharing a semantic development to ‘to rage’. However, the Baltic verbs are so semantically divergent that it is unlikely that they belong to this cluster.

3.5.22. **g^wes-e/o-* ‘to be extinguished’, **g^wōs-eie/o-* ‘to extinguish’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Rejected	^v Derivation

Indo-Aryan: Skt. *jāsamāna-* aor.ptc.med. ‘being extinguished’, *jāśayati* ‘to exhaust’

Iranian: –

Baltic: Lith. *gèsti*, *gęsta* ‘to be extinguished’; Latv. *dzēst*, *dzešu*, *dzēšu* ‘to extinguish, put out’

Slavic: OCS *ugasiti*, *ugašq* ‘to extinguish’; Ru. *gasít’*, *gašú* ‘to extinguish’; Pol. *gasić*, *gaszeć* ‘to extinguish’; SCr. *gásiti*, *gāšīm* ‘to extinguish’

Arntz (1933: 48) and Schmidt (1872: 46) listed both a thematic present and a causative formation from PIE **g^wes-* as Indo-Slavic isoglosses. However, the stem Skt. *jāsa-*, only attested as a participle, is rather an aorist (Gotō 1996: 84) and cannot be equated with Lith. *gèsti*. As for the causative, while Skt. *jāśayati* and Slavic **gasiti* can formally both be derived from **g^wōs-eie/o-* (with analogical palatalization in Sanskrit), lengthened *ō*-grade is not expected and indicates that these are independent formations.

3.5.23. **g^wi-n-h₃-* ‘to feed’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^v Derivation

Indo-Aryan: Skt. *jinóti* ‘to impel, feed, strengthen’

Iranian: –

Baltic: –

Slavic: OCS *žěti*, *žbnjō*, *žbnq* ‘to reap, mow’; Ru. *žat’*, *žnu* ‘to reap, mow’; Pol. *żąć*, *żnę* ‘to reap, mow’; SCr. *žěti*, *žānjēm* ‘to reap, mow’

Although they are not formally identical, these Sanskrit and Slavic nasal presents have been argued to go back to the same Indo-European formation (LIV: 215). According to Vaillant (III: 306), Slavic underwent a change from the original meaning to ‘to provide subsistence, collect food’ as the nasal stem was lexicalized in a neo-root **žbn-*. However, a more plausible etymology for the Slavic verb is **g^when-* ‘to beat, slay’ (Derksen 2008: 561), which was used in cereal processing contexts already at an early date, cf. Skt. *parśān hanmi* ‘I thresh sheaves’, Gr. Περσεφόνη ‘a Goddess; “the threshing maiden”’ (Wachter 2007). Accordingly, the connection to Indo-Iranian may be rejected.

3.5.24. *g^wrH- ‘rock’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Albanian, Greek?)	Compelling	Possible	Root

Indo-Aryan: Skt. *giri-* m. ‘mountain, hill’

Iranian: YAv. *gairi-* m. ‘mountain’; Khot. *gara-*, *ggari-* ‘mountain’; Sogd. *γr-* ‘mountain’; Psht. *γar* ‘mountain, pile of stones’; Yi. *γar* ‘hill, mountain’; Yazg. *γār* ‘stone, cliff, crag’

Baltic: Lith. *girià*, (Žem.) *gìrė* f. ‘woods’; Latv. *dziņa*, *dzire* f. ‘woods’; OPr. *garian* (EV), *garrin* f. (Ench.) ‘tree’

Slavic: OCS *gora* f. ‘mountain’; Ru. *gorá* f. ‘mountain’; Pol. *góra* f. ‘mountain’; SCr. *gòra* f. ‘mountain, (dial.) wood’

Schmidt (1872: 47) and Arntz (1933: 48) listed the above words as an Indo-Slavic isogloss. However, Alb. *gur* m. ‘stone, rock’ cannot be separated from this cluster (Demiraj 1997: 181), which means that the isogloss is non-exclusive.

Gr. *δεῖράς* f. ‘height, mountain ridge’ has been connected, but it is not easy to explain formally from *g^w(e)rH-; it is better derived within Greek from *δέρη* ‘neck, ridge’ (Beekes 2010: 311). Gr. *βορέας* m. ‘north wind, north’ is a less problematic possible cognate, perhaps derived from an unattested *βόρειος ‘of the mountain’, but this remains speculative.

The exact reconstruction is unclear. The East Iranian thematic stems can be later replacements of the *i*-stem otherwise attested in Khotanese, Avestan, and Sanskrit (Emmerick 1968: 289). For PIr. we may thus reconstruct *grH-*i*-. Balto-Slavic shows alternation between zero-grade and *o*-grade in the root, as well as suffix variation, which points to an original athematic paradigm. The meaning ‘wood’ in Baltic (and marginally in Slavic) is likely secondary from ‘mountain’. Alb. *gur* must go back to a form with zero-grade in the root, but it can hardly reflect an *i*-stem, as this would have caused *i*-mutation of **u* > *y*, cf. Alb. (sh)typ ‘to crush’ < *tup-*ie/o-*, kryq ‘cross’ << Lat. *crucem*.

It is unclear whether all branches ultimately reflect the same stem, or if we must reckon with independent derivations. As for the root, a possible candidate is *g^wreh₂-, reflected in Skt. *gurú-* ‘heavy’ and *grávan-* m. ‘pressing stone’, provided that the position of the full grade vowel in Slavic *gorà ‘mountain’ is secondary.

3.5.25. *g^(w)riH-ueh₂- ‘neck, nape’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Albanian)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *grīvā-* f. ‘neck, nape’

Iranian: YAv. *grīuuā-* f. ‘neck (of Daevic beings)’; MiP Pahl. *grīw* ‘neck, throat’; MoP *girībān* ‘neck-guard, gorget’

Baltic: Latv. *grīva* f. ‘estuary’

Slavic: Ru. *gríva* f. ‘mane’; Pol. *grzywa* f. ‘mane’; SCr. *grīva* f. ‘mane’

The Indo-Iranian forms (EWAia I: 509; AirWb.: 530) and the Balto-Slavic forms (Derksen 2015: 535; Vasmer I: 309) are formally identical and have similar, but not identical, semantics. Latv. *grīva* ‘estuary’ may be understood as a metaphor of ‘neck’ or ‘throat’, but hardly ‘nape’ or ‘mane’, indicating that the Proto-Balto-Slavic meaning was ‘neck’. This stem was listed as an Indo-Slavic isogloss by Schmidt (1872: 47), Arntz (1933: 45), and Porzig (1954: 167).

Gr. δέπῃ f. ‘neck’ (Ion. δείπη, Lesb. δέπα) is often adduced, but the Greek dialectal evidence precludes a reconstruction ***g^wer(H)-eh₂-*. In any case, the Greek word does not have **-iH-* in the root. It may alternatively be connected to Gr. δειράς f. ‘height, mountain ridge’ (Beekes 2010: 311).

However, Alb. *grykë* f. ‘throat’ < **grīwīkā-* (Orel 1998: 126) << **grīwā-* is a cognate to the Indo-Iranian and Balto-Slavic words that apparently has escaped the notice of most etymological dictionaries. The stem **g^(w)riH-ueh₂-* ‘neck, nape’ is thus not exclusively Indo-Slavic, but includes Albanian.

The stem **g^(w)riH-ueh₂-* has been argued to be derived from **g^werh₃-* ‘to swallow’ (EWAia I: 509). If correct, one would have to assume an *i*-present **g^wrh₃-(o)i-* from which a *ueh₂*-stem noun was derived (or perhaps with an intermediate *u*-stem), reminiscent of a derivational chain described by Lubotsky (2011). Since no *i*-present or related verbal stem is attested for **g^werh₃-* (see LIV: 211–12; Lith. *geriù* can be recent), this would have to be an archaic derivation. There are other potential Proto-Indo-European words for ‘neck’, most prominently **mon(H)-i-*, which is continued in Skt. *mānyā-* f.du./pl. ‘neck’, YAv. *zarənu-maini-* ‘with a golden necklace’, Lat. *monīle* n. ‘necklace, collar’, Mlr. *muin* f. ‘the upper part of the back below the neck’, and OHG *mana* f. ‘neck, mane’. Furthermore, **kneK-n-*, reflected in Germanic **hnekkā-* ~ **hnakka(n)-* ‘neck’ and ToA *kñuk* ‘neck’ (Kroonen 2013: 234) must be quite archaic. However, it cannot be excluded that **g^(w)riH-ueh₂-* co-existed with these stems in PIE (*pace* Porzig 1954: 167), forming a triad with slightly different semantics, viz. ‘neck’, ‘throat’, and ‘nape’.

3.5.26. **(H)roh₁d^h-i* postpos. ‘on account of, for the sake of’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation

Indo-Aryan: (Skt. *rādh-* ‘to succeed, be successful’)

Iranian: OP *avahya-rādiy* ‘for this reason’; Parth. *rād* ‘on account of’; MoP *rāy* ‘on account of’

Baltic: (Lith. *ródyti, ródo* ‘to show, indicate, demonstrate’)

Slavic: OCS *radi* ‘for the sake of, because of’; SCr. *rādi, rādi* ‘for the sake of’; Sln. *zarādi* ‘because of’

The root is also found in PGm. **rēdan-* ‘to decide’ (Kroonen 2013: 408), OIr. *-ráidi* ‘deliberates, says’, and may be reconstructed as **Hre/oh₁d^h-* (similarly LIV: 499–500). Meillet (1926: 166) presents the postposition found in Iranian and Slavic as a strong isogloss (also Schmidt 1872: 48; Vasmer II: 482). However, unlike the related verbal stem

OCS *raditi* ‘to care about’, SCr. *ráditi* ‘to work, do’, the accentuation of SCr. *râdi*, Sln. *zarâdi* does not seem to be compatible with a laryngeal in the root, which indicates that it is rather a borrowing from Iranian (cf. Derksen 2008: 432). The fact that Baltic and Indo-Aryan cognates are missing is consistent with this conclusion.

3.5.27. **h₁endro-* ‘kernel; egg, testicle’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation

Indo-Aryan: Skt. *āṇḍá-* n. ‘egg, testicle’

Iranian: –

Baltic: –

Slavic: Ru. *jadró* n. ‘kernel, core’; Pol. *jądro* n. ‘grain, kernel, core’; SCr. *jédro* n. ‘kernel, core’

This old comparison was listed as an isogloss by Schmidt (1872: 46) and Arntz (1933: 50). However, the words can hardly be related, since the alleged development **ndr* > Skt. *ṇḍ* must be rejected. Semantically, the comparison is not particularly compelling.

3.5.28. **h₁(e)r(H)ks-* ‘thorn’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	Root

Indo-Aryan: Skt. *anṛkṣará-* adj. ‘?’

Iranian: –

Baltic: Lith. *erškėtis* m. ‘thorn-bush’; Latv. *ēršķis* m. ‘thorn-bush, thorn, prickle’

Slavic: Sln. *rěšək* m. ‘sow thistle’

Arntz (1933: 38) listed the above words as an Indo-Slavic isogloss. Skt. *anṛkṣará-*, occurring four times in the RV, describing a path, has traditionally been translated as ‘thornless’. Derksen (2015: 156) tentatively accepts the connection, but remarks that the Baltic evidence points to a laryngeal in the root, which is incompatible with Skt. *anṛkṣará-*.

However, the translation of Skt. *anṛkṣará-* as ‘thornless’ is incorrect. As Jamison (1993) has convincingly argued, there is no evidence in favour of this translation, since the supposed base **ṛkṣara-* ‘thorn’ is neither attested, nor can be inferred from etymological considerations. According to her, *anṛkṣará-* is better analysed as *a-nṛ-kṣar-á-* ‘not sweeping men away’, i.e., ‘harmless for men’. Thus, the proposed isogloss must be rejected.

3.5.29. **h₁mene* ‘of me’ (1sg.gen. pronoun)

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Anatolian, Celtic, Tocharian)	Compelling	Rejected	^N Derivation

Indo-Aryan: Skt. *máma* ‘of me’

Iranian: OAv. *mā.nā*, YAv. *mana* ‘of me’; OP *manā* ‘of me’

Baltic: Lith. *manęs* ‘of me’; Latv. *manis* ‘of me’

Slavic: OCS *mene* ‘me, of me’; ORu. *mene* ‘id.’; SCr. *méne*, *měne* ‘me, of me, to me’

The Iranian and Slavic forms reflect **h₁mene* (AirWb.: 1098–99; Derksen 2008: 308). Skt. *máma* is usually explained by assimilation or by contamination with the acc.sg. *mám* (EWAia II: 284–85), whereas the Baltic forms may have been influenced by the 2sg. (Derksen 2015: 304).

Meillet (1926: 167) considered **h₁mene* to be a strong Indo-Slavic isogloss. Porzig (1954: 164) assumes that the genitive of the 1sg. personal pronoun was uninflected in Proto-Indo-European and regards the ending *-ne* as a shared innovation of Indo-Slavic. However, since MWelsh *vy* ‘my’ (with nasalization) also reflects **mene*, the isogloss is non-exclusive. Furthermore, Kloekhorst (2008: 111) argues that Hitt. obl. stem *amm-* goes back to **h₁mne-* and suggests that the pronominal stem **h₁me-* preserved in Core Indo-European branches is a dissimilation of this form (for the dissimilation, cf. Skt. *drāghmán-* ‘length’, instr.sg. *drāghmā*). Additionally, the palatalized anlaut of ToB *ñäś* ‘I’ may originate in **h₁m(e)ne-*. This would imply that the genitive **h₁mene* is an archaism, reconstructable to Proto-Indo-Anatolian.

3.5.30. **h₁(o)r-ti-* ‘attack, fight’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Rejected	^N Derivation

Indo-Aryan: Skt. *ṛtí-* f. ‘attack’ (VS), *ṛti-* f. ‘attack, hit’ (AV+)

Iranian: YAv. *ərəti-* f. ‘energy (?)’

Baltic: –

Slavic: OCS *ratъ* f. ‘war, fight’; ORu. *ratъ* f. ‘war, battle, troops’; SCr. *răt* m. ‘war’

Schmidt (1872: 48) listed these words as an Indo-Slavic isogloss. YAv. *ərəti-* may belong here, although the translation is uncertain (cf. AirWb.: 350). Formally, Skt. *ṛti-*, *ṛtí-*¹⁷¹ looks like a *ti-* stem from *ar-* ‘to reach, come towards, meet with’, but given its semantics it is likely old. While the etymology is semantically compelling, the Indo-Iranian zero-grade in the root vs. Slavic *o*-grade is not easily explained, since *ti*-stems otherwise have no root ablaut. It is thus unlikely that the forms go back to a shared proto-form. To connect them,

¹⁷¹ The accentual variation is secondary. Skt. *ṛtí-*, *ṛti-* ‘attack’ should not be confused with *ṛtí-* ‘manner, way’ < **h₂r-ti-*, cf. Lat. *ars* ‘art’.

one would have to assume a proterodynamic stem **h₁or-ti-* / **h₁r-tei-*, which would indicate an archaism.

3.5.31. **h₁ui-d^hh₁-eu-eh₂-* ‘widow’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Greek)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *vidhāvā-* f. ‘widow’

Iranian: YAv. *viδauua* nom.sg.f. ‘widow’

Baltic: OPr. *widdewū* f. ‘widow’

Slavic: OCS *vdova* f. ‘widow’; Ru. *vdová* f. ‘widow’

According to Meillet (1926: 171), the Indo-Iranian and Balto-Slavic forms of the Indo-European word for ‘widow’ share a full grade in the suffix versus zero-grade in Goth. *widuwo* f. and OIr. *fedb* f. However, Gr. ἡθεις m. ‘unmarried youth’, which is likely derived from the older feminine stem, likely shows the same full grade of the suffix, and the isogloss is thus non-exclusive. Lat. *vidua* f. ‘widow’ could be derived from either zero-grade or full grade in the suffix.

3.5.32. **h₁ui-d^hh₁-u-r(i)o-* ‘separated’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation

Indo-Aryan: Skt. *vidhura-* adj. ‘bereft, bereaved, alone, solitary’ (Kāv.; Rājāt.), *vi-dhura-* adj. ‘(a chariot) without shaft’ (MBh.), *vithurá-* adj. ‘shaky’ (RV)

Iranian: YAv. *aiβiθūra-* adj. ‘rings, sehr siegreich’

Baltic: Lith. *vidurỹs* m. ‘middle’

Slavic: –

The Indo-Iranian material is rather obscure. First, Skt. *vi-dhura-* ‘(a chariot) without shaft’ (MBh.) is a transparent compound from *dhúr-* ‘joint, pivot of the chariot pole and the yoke’ and likely unrelated to the rest (cf. Monier-Williams 1899: 951). Conversely, *vidhura-* ‘bereft (etc.)’ has traditionally been regarded as a secondary and corrupt form of Vedic *vithurá-* ‘shaky’ (AiGr. II, 2: 486; EWAia II: 554; KEWA III: 208). Yet, the semantics of *vidhura-* are better explained if we assume an etymological connection to Skt. *vidhú-* ‘solitary’ and *vidhāvā-* f. ‘widow’ (ultimately from PIE **h₁ui-d^hh₁-u-* ‘set apart’). Thus, the fact that the roots *vidh-* ‘to allot, apportion’ and *vyath-* ‘to shake, stumble’ were eventually conflated in later Sanskrit does not necessarily imply that *vidhura-* is corrupt. YAv. *aiβiθūra-* (AirWb.: 92) has generally been taken as a cognate of Skt. *āvithura-* ‘unshakeable’, but could theoretically be connected to *avidhura-* with Kümmel’s Iranian laryngeal devoicing rule (2018).

Within Baltic, Lith. *vidurỹs* ‘middle’ is clearly related to *vidūs* m. ‘middle’ and *vidur̃* ‘in the middle’ (LEW: 1238). Lith. *vidūs* ‘middle’ is further related to Skt. *vidhú-* ‘solitary’,

ON *viðr* m. ‘tree, wood’ < PGM. *widu-* and OIr. *fid* m. ‘tree, wood, forest’ (IEW: 1177). Of the attested forms, the semantics of Skt. *vidhū-* ‘solitary’ seem to be closest to PIE **h₁ui-d^hh₁-u-* ‘set apart’. The semantics of Lith. *vidurys* rather suggests that it was derived within Baltic from *vidūs* ‘middle’, after this had already shifted from the original meaning ‘set apart’. Although the ultimate origin of the suffix *-urys* is unclear, it is not uncommon in Lithuanian, cf. *dubūs* ‘hollow, deep’ ~ *duburys* ‘hollow, hole, pond’; *angis* ‘snake’ ~ *ungurys* ‘eel’ (see further Skardžius 1941: 309). In this regard the adverbial form *viduř* ‘in the middle’ may provide a crucial link between *vidūs* and *vidurys* and explain the latter as a deadverbial *io*-stem. Thus, it seems unlikely that Lith. *vidurys* and Skt. *vidhura-* represent the same formation.

3.5.33. **h₂eg^(w)-ro-* ‘top; first, early’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation Root

Indo-Aryan: Skt. *ágra-* n. ‘top, summit, beginning’

Iranian: YAv. *ayra-* adj. ‘first, topmost’

Baltic: Latv. *agrs* adj. ‘early’

Slavic: –

Arntz (1933: 38) listed this as an Indo-Slavic isogloss (see also EWAia I: 45). However, the etymology must be rejected, as the short vowel of Latv. *agrs* is not compatible with the Indo-Iranian media.

3.5.34. **h₂ep-* ‘water’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Tocharian, Italic, Armenian)	Compelling	Possible	Root

Indo-Aryan: Skt. *áp-* f. ‘water’

Iranian: OAv., YAv. *ap-* f. ‘water’; OP *ap-* f. ‘water’

Baltic: Lith. *ùpė* f. ‘river, stream’; Latv. *upe* f. ‘river, stream’; OPr. *ape* ‘brook, stream’ (EV)

Slavic: –

Arntz (1933: 50) lists the root noun **h₂ep-* ‘water’ as an Indo-Slavic isogloss. The Indo-Iranian and Baltic words (of which the vocalism of the East Baltic words is unclear) have been compared with Hitt. *ḫapa-* c. ‘river’,¹⁷² CLuw. *ḫāpa/i-* c. ‘river’, Pal. *ḫāpna-* c. ‘river’ and OIr. *aub* f. ‘river’, which, however, reflect **h₂eb^(h)-*. Furthermore, Lat. *amnis* f. ‘stream, river’ and ToAB *āp-* ‘river (?)’ may be adduced, although these may in theory reflect either

¹⁷² According to Kloekhorst (2008: 295), the meaning of the alleged Hittite all.sg. *ḫāppa* ‘to the river’, with geminate *-pp-* < **p* rather than **b^(h)*, cannot be determined.

**h₂ep-* or **h₂eb^(h)-* (see further Wodtko, Irslinger & Schneider 2008: 311ff).¹⁷³ Hamp (1972) attempted to clarify the relationship between these two variants by reconstructing **h₂ep-h₃on-*, based on the *n*-stems of Palaic and Celtic, with *h₃*-voicing as in Skt. *pībati*, OIr. *ibid* ‘to drink’ < **pi-ph₃-e-*. A possible unambiguous non-Indo-Slavic cognate is Arm. *hawari* ‘river-bed, river-shore’, which could reflect **h₂ep-* ‘river’ + **sr(o)u-* ‘to flow’ (Martirosyan 2010: 206).

In sum, although the most transparent reflexes of **h₂ep-* are attested in Indo-Iranian and Baltic, evidence from other branches cannot confidently be refuted, and the isogloss cannot be maintained.

3.5.35. **h₂eu-* ‘to weave’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Albanian)	Compelling	Possible	Root

Indo-Aryan: Skt. *o-* ‘to weave’, pres. *váyati*

Iranian: –

Baltic: Lith. *áusti, áudžia* ‘to weave’; Latv. *aúst, aūžu* ‘to weave’

Slavic: –

Arntz (1933: 54) argued that the unenlarged root of Lith. *áusti* ‘to weave’ < **h₂eud-* is preserved only in Lith. *auklė* f. ‘shoelace’ and Skt. *o-* ‘to weave’ < **h₂eu-*. However, Alb. *vej* ‘to weave’ may in fact reflect the same present stem formation as Skt. *váyati* ‘to weave’ < **h₂u-eie/o-* (Demiraj 1997: 413), which means that the isogloss is non-exclusive.

3.5.36. **h₂eu-o-* 3sg.pron. ‘that’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Rejected	^N Derivation

Indo-Aryan: –

Iranian: OAv., YAv. *auna-* ‘that’; OP *ava-* ‘that’; MiP Pahl. *ōy*, Man. ‘wy’ ‘he, she, that’; Sogd. *w-* ‘that, the’

Baltic: –

Slavic: OCS *ovъ* ‘someone, someone else, other’; Pol. *ów* ‘that’; SCr. *òvāj* ‘this’

Both Iranian (AirWb.: 163–67) and Slavic (Vasmer II: 251; Derksen 2008: 384) attest demonstrative pronoun stems that may be unified under a reconstruction **h₂eu-o-*. It was proposed as an isogloss by Schmidt (1872: 48). Skt. gen.du. *avós* ‘of those two’ has traditionally been connected, but is rather an assimilated variant of *ayós* (Klein 1977; EWAia I: 135).

The pronoun has variously been derived from **h₂eu-* ‘away’ (Dunkel 2014, 2: 96, 111) or **h₂eu-* ‘again’ (Beekes 2010: 173), which may ultimately be the same root. The

¹⁷³ Since Lat. *amnis* seems to be derived from an *n*-stem, it is likely from the same Proto-Italo-Celtic **h₂eb^(h)-on-* that also gave OIr. *aub*.

root is widespread in Indo-European, e.g., Hitt. *u-* ‘hither’, Skt. *áva* ‘away, off’, OIr. *ua-* ‘neg. prefix’, Lith. *au-* ‘away’, Lat. *aut* ‘either ... or’, Gr. *αὐ* ‘again, on the other hand’. Gr. *αὐτός* ‘self; the same’ ~ Phryg. *auto-* ‘self’ is another pronominal derivative (most likely from **h₂eu-* ‘again’). The Albanian deictic particle *a-* reflected in Alb. *ai, ajó, atá* ‘ille, -a, -ud’ probably also continues **h₂eu-*.

Lyd. *osk* nom.-acc.pl. ‘and that’ and Car. *u-* ‘the one by you’ are adduced as further evidence for a PIE pronoun **h₂eu-o-* by Dunkel (2014, 2: 111). However, the Lydian word can hardly be equated to YAv. *auua-* etc. in view of the *-s-*, which goes back to PIE **si* (cf. Melchert 1994: 337). Yet, Melchert (2009: 157) does derive Lyd. *os-* and (hesitatingly) Car. *u-* from **e/ouo-*, stating that the Lydian form was secondarily inflected. However, Carian preserves **h₂* as *k* (Adiego Lajara 2007: 260), and the same is likely true for Lydian (Yakubovich 2019). A more plausible etymology is that proposed by Eichner (1988: 55), who explained *os-* from *au-* + *es-* ‘this’.

Although **h₂eu-o-* seems to be limited to Iranian and Slavic, there are strong indications that the Iranian form is a relatively recent innovation. The nom.sg.m. OAv. *huuō*, YAv. *hāu* look like the pronoun **sa* + particle **u* or **au*, respectively. This form must be compared with Skt. nom.sg.m. *asáu* ‘ille’, to which the pronominal stem **a-* was added. Tedesco (1947) reconstructed a PIr. nominative **sāu* and argued that the Iranian non-nominative stem **aua-* was created by adding the deictic particle **au-* to the pronominal stem **a-*. In Indo-Aryan, the particle was instead post-posed in its zero-grade form,¹⁷⁴ leading to acc.sg.m. **am-u*, which was regularized to Skt. *amúm* and used as the base for a new paradigm with the stem *amú-*. The “irregularity” of the Sanskrit paradigm shows that **aua-* did not exist in Proto-Indo-Iranian, as there would otherwise be no reason to innovate *amú-*. In fact, even the reconstruction of **sāu* is uncertain, since OAv. *huuō* rather reflects **sau*,¹⁷⁵ implying the existence of two different nominative forms in Proto-Iranian. This means that Iranian **aua-* cannot be directly compared to Slavic **ovъ*, which may have been independently derived from **h₂eu-* within Slavic.

3.5.37. **(h₂)gr-ōm-* ‘heap’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Rejected	^N Derivation

Indo-Aryan: Skt. *grāma-* m. ‘train, troops, village community’

Iranian: MiP Pahl. *grāmag* ‘wealth’; Sogd. B *γr’m’k* ‘riches’; Khwar. *γr’m* ‘weight, burden’; Oss. I *æryom* / D *æryon* ‘bundle of firewood, burden, load’

Baltic: Lith. *grūmulas* m. ‘lump’, *gramañtas* m. ‘big lumps’, *gromulys*, *grōmulas* n. ‘cud, rumination, digestion’

Slavic: RuCS *gromada* f. ‘heap, pile, bonfire’; OCS *gramada* f. ‘heap, pile’; ORu. *gromada* f. ‘heap, pile, bonfire’, *gramada* f. ‘pile’; Pol. *gromada* f. ‘pile, multitude, village

¹⁷⁴ However, in the neuter, the full grade was used, i.e., *adó* < **adáu* (cf. Tedesco 1947: 119).

¹⁷⁵ Cf. De Vaan (2003: 365). Narten argued that OAv. *huuō* was replaced in Young Avestan by the feminine *hāu*, but one must agree with Tedesco (1947: 118) that this is rather unlikely, especially since masculine **sa* + *au* is paralleled by Skt. *asáu* and neuter *adó*.

community, gathering'; SCr. *gromáda*, *grmada* f. 'cliff, crag, heap, pile', *gramáda* f. 'clod, pile of firewood'

The Indo-Iranian and Balto-Slavic words are often compared (EWAia I: 507–8; Derksen 2015: 191) and constitute a potential Indo-Slavic isogloss. However, several problems regarding the Balto-Slavic forms as well as the deeper Indo-European etymology have not been sufficiently addressed.

First, the Balto-Slavic material presents several difficulties. The irregular vocalism of Lith. *grūmulas* has been suggested to reflect a metathesized zero-grade **gur-m-*, possibly through contamination from *gūmulas* 'lump' (Derksen 2008: 190). In terms of root vocalism, Lith. *gramañtas* (LEW: 162) is closer to the Slavic forms, but the suffix *-añtas* remains unexplained. If Lith. *gromulỹs* belongs here, the vacillation of *o/a* in the root does not look old. For Slavic, we must reckon with three different variants, viz. **gromada* (East, West, South Slavic), **gramada* (East, South Slavic) and **grmada* (South Slavic). The root vocalism hardly reflects old ablaut, but rather indicates a more recent formation. The unexplained suffix *-ada-* presents a further argument against an old athematic *m*-stem. On the whole, the Balto-Slavic evidence does not point to an inherited etymon.

For Proto-Indo-Iranian, a stem **grāma-* may be straightforwardly reconstructed. However, the deeper Indo-European etymology is uncertain. PIr. **grāma-* has been derived from **h₂ger-* 'to gather' (cf. Gr. ἀγείρω 'to gather'), in which case one would have to assume an athematic stem **h₂gr-om-* (cf. **d^hǵh-om-* 'earth') with subsequent thematization in Indo-Iranian. As athematic *m*-stems are exceedingly rare, and the root **h₂ger-* is otherwise unattested in Indo-Iranian, this etymology is far from certain. Another possibility is to reconstruct **graHma-* and connect it to Skt. *grāvan-* m. 'pressing stone' and *gurú-* 'heavy, hard, vehement'. This is especially attractive in view of the semantics of Khwar. *γr'm* 'weight, burden' and Oss. I *æryom* / D *æryon* 'burden, load', from which the meaning of Skt. *grāma-* 'train, troops, village community' may have developed secondarily. The Slavic variants with short **o* in the root, e.g., RuCS *gromada* 'heap, pile, bonfire', are incompatible with PIr. **graHma-*.

Lat. *gremium* n. 'lap, bosom' has been adduced as a cognate, but it is hardly old, since it has not undergone the sound change **-mj-* > Lat. *-ni-* (de Vaan 2008: 272). De Vaan argues that *gremium* may have been derived within Latin from an earlier **gremo-*, in turn derived from a stem variant of **h₂gr-om-*. However, the meaning of *gremium* is not very close to Indo-Iranian **grāma-*. Furthermore, as argued above, the reconstruction of an athematic *m*-stem is problematic. Lat. *gremium* may instead belong with MHG *krimmen* 'to grab, squeeze' < PGm. **krimman-* 'to crumble' (Kroonen 2013: 305).

In conclusion, an etymological connection between Indo-Iranian **grāma-* and the Balto-Slavic material cannot be supported and it should be rejected as an Indo-Slavic isogloss.

3.5.38. **h₂ōu-is* ‘evidently, manifestly’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Germanic, Greek, Italic)	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *āviś* adv. ‘evidently, manifestly’

Iranian: OAv., YAv. *āuiš* adv. ‘apparently, evidently’

Baltic: Lith. *ovyje* adv. ‘in reality’

Slavic: OCS *javě, avě* adv. ‘manifestly, openly, clearly’; SCr. *javi* adv. ‘just like, as if’

Schmidt (1872: 47), Meillet (1926: 173), and Arntz (1933: 48) list this adverb as an isogloss of Indo-Iranian and Balto-Slavic. However, this conclusion has several problems.

First, an *e*-grade variant **h₂eu-is* likely formed the basis of Lat. *audiō* ‘to hear’ and Gr. αἰσθάνομαι ‘to perceive’ < **h₂eu-is-d^hh₁-*, as well as Gr. αἶω ‘to perceive, hear’ (IEW: 78; de Vaan 2008: 61; Beekes 2010: 43, 46). Moreover, Kroonen (2013: 45) has argued convincingly that OE *ēawis* ‘apparent’ and OHG *awi-zoraht* ‘evident’ preserve a Germanic reflex **awiz*, which could continue a long or short root vowel, as a long vowel would have undergone Dybo’s pretonic shortening (cf. the oxytone Skt. *āviś*).

Second, the Indo-Iranian and Balto-Slavic forms are difficult to reconcile formally, since Slavic **a* points to **ō* or **ē*. Lith. *ovyje* ‘in reality’ rather points to **eh₂*, but may be a borrowing from Slavic (cf. Derksen 2015: 341). While a lengthened grade is formally possible for Indo-Iranian (thus EWAia I: 177), it makes little sense from a morphological perspective. A more plausible reconstruction would be **h₂ou-is*, with Brugmann’s Law, which may be independently supported by Gr. οἶομαι ‘to suspect, expect, think, believe, deem’ (Beekes 2010: 1059–60). The *o*-grade may have been taken over from the verbal stem, cf. Hitt. 1sg.pres. *uḫḫi* ‘I see’ < **h₂ou-h₂ei*. Since OCS *javě, avě* is incompatible with a reconstruction **h₂ou-is*, it may rather be explained as a borrowing from Iranian.

3.5.39. **h₂sous-eie/o-* ‘to make dry (up)’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Germanic)	Doubtful	Rejected	^V Derivation

Indo-Aryan: Skt. *śoṣáyati* ‘to make dry up’ (AV)

Iranian: MiP Pahl. *hōš-* ‘to dry up, wither’; MoP *xōš-* ‘to dry’

Baltic: Lith. *saūsinti, -ina*, (dial.) *saūsyti, saūso* ‘to dry (something) off’; Latv. *sausināt* ‘to dry’

Slavic: OCS *sušiti, sušjō* ‘to dry, exhaust’; Ru. *sušít’, sušú* ‘to dry’; Pol. *suszyć, suszę* ‘to dry’; SCr. *súšiti, sūšīm* ‘to dry’

Indo-Iranian and Balto-Slavic both attest *eie/o*-stems from **h₂seus-* ‘to be dry’ (for the denominative origin of this root, cf. Lubotsky 1985). However, Nw. *søyre* ‘to make dry’, although not unlikely secondary from *søyr* adj. ‘dry’, could also reflect **h₂sous-eie/o-*. In any case, Skt. *śoṣáyati* ‘to make dry up’ (with secondary *ś-*) could be a productive

formation after the intransitive Skt. *śuśyati* ‘to dry up’ (Jamison 1983: 145). Lith. *saūsinti* ‘to dry (something) off’ and Latv. *sausināt* ‘to dry’ are probably better analysed as denominal from the adjective Lith. *saūsas* ‘dry’ etc.

3.5.40. **h₂uodH-eie/o-* ‘to speak’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Rejected	^V Derivation

Indo-Aryan: Skt. *vádati* ‘to raise one’s voice, speak, talk’ (RV+), *vādayati* ‘to make speak’ (Br.+)

Iranian: –

Baltic: –

Slavic: OCS *vaditi*, *važdŏ* ‘to accuse’; Ru. *vádit’* ‘to slander, lure, spend time, deceive’; Pol. *wadzić*, *wadzę* ‘to annoy, hamper’; Sln. *váditi*, *vādim* ‘to report, charge’

Arntz (1933: 55) compared the causative Skt. *vādayati* ‘to make speak’ to OCS *vaditi* ‘to accuse’. However, the Sanskrit form is not attested in the oldest language and may well be a productive formation. Moreover, the Slavic verbs have divergent semantics, and one may wonder whether at least some of the attested forms are rather derived from **ued^h-* ‘to lead’, cf. Lith. *vadinti* ‘to call’, Latv. *vadīnāt* ‘to lead, accompany, urge, lure’.

3.5.41. **h₃nob^h-i-* / **h₃nob^h-H-* ‘nave, navel’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Germanic)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *nābhi-* f. ‘nave, navel; origin, relation, kin’, *nābhā-nédiṣṭha-* ‘PN’

Iranian: YAv. *nāfa-* m. ‘navel; relative, family’, *nabā-nazdišta-* ‘next of kin’

Baltic: Latv. *naba* f. ‘navel’; OPr. *nabis* ‘nave, navel’

Slavic: –

Skt. *nābhi-* (cf. EWAia II: 13–14) is often reconstructed as an *i*-stem (Wodtko, Irslinger & Schneider 2008: 385). OPr. *nabis* (Derksen 2015: 562) has been argued to derive from the same formation (Klingenschmitt 1978: 100), in which case the *i*-stem could constitute an Indo-Slavic isogloss. However, the Prussian form could just as well reflect an *o*-stem, cf. OPr. *deywis* ~ Lith. *diēvas* (Stang 1966: 181). Furthermore, the distribution of voiceless *-f-* in YAv. *nāfa-* vs. voiced *-b-* in *nabā*¹⁷⁶ points to an old athematic *H*-stem **h₃nob^h-H-* / **h₃nb^h-eH-*, which could also explain the *i*-stem of Sanskrit as a result of laryngeal vocalization (Kümmel 2021). This athematic *H*-stem could also be the basis for the Baltic forms, as well as ON *nōf* ‘nave’, OHG *naba* ‘nave’ etc. (cf. Kroonen 2013: 380–81).

¹⁷⁶ Possibly, the short root vowel of YAv. *nabā-* is the result of secondary shortening (de Vaan 2003: 137–38).

3.5.42. **ieu-o-* ‘grain, barley’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Anatolian, Greek)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *yáva-* m. ‘grain, corn, crop, barley’

Iranian: YAv. *yauua-* m. ‘grain’; MiP Pahl. *ǰaw* ‘barley; Oss. *ǰaw* ‘millet’; Par. *žō* ‘barley’

Baltic: Lith. *javaĩ* m. ‘corn, grain’

Slavic: –

Porzig (1954: 169) takes **ieu-o-* as an isogloss, since Gr. ζεαί f.pl. ‘one-sided wheat, spelt’ reflects a different derivation (**ieu-ieh₂-*). The Greek word may be derived from the *o*-stem, however. Moreover, Hitt. *eyan-* n. ‘a kind of grain’ shows that the root is Indo-Anatolian. The Hittite word is sometimes inflected as an *o*-stem, but even if this is old (which Kloekhorst 2008: 263–64 deems unlikely), the neuter gender could point to an independent formation from Skt. *yáva-* etc. (see further Weiss 2021).

Arm. *ǰov* ‘sprout, branch; string’ is formally comparable to **ieu-o-*, but the meaning is too far removed to make it a likely cognate. ToB *yap* ‘barley’ is borrowed from an Indo-Iranian source (Peyrot 2018: 245).

3.5.43. **ki(e)h₁-uo-* ‘dark, black, grey’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Germanic)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *śyāvá-* adj. ‘dark brown, dark’

Iranian: YAv. *siiāuua*^o adj. ‘dark’ (in names); MiP Pahl. *syā*, Man. *sy’w* adj. ‘black’; Khot. *śāva-* ‘copper, copper-coloured’; Sogd. *š’w* adj. ‘black’; Khwar. *s’w* adj. ‘black’; Oss. *saw* adj. ‘black’

Baltic: Lith. *šývas* adj. ‘light grey (of horses)’; OPr. *sywan* adj. ‘grey’ (EV)

Slavic: Ru. *sívyj* adj. ‘grey’; Pol. *siwy* adj. ‘grey’; SCr. *sǐv* adj. ‘grey’

The Indo-Iranian (EWAia II: 661; AirWb.: 1631; Abaev III: 42–43) and Balto-Slavic words (LEW: 996; Vasmer II: 621) have been taken as an Indo-Slavic isogloss by Schmidt (1872: 49), Arntz (1933: 43) and Porzig (1954: 166–67). However, OE *hāwi* ‘blue, purple, grey, discoloured’ < PGm. **hēwja-* (Kroonen 2013: 224) cannot be excluded as a cognate and the isogloss is therefore non-exclusive. It is also notable that the Balto-Slavic forms show zero-grade of the root, whereas Indo-Iranian has full grade, indicating that they are separate thematicizations of an earlier *u*-stem.

3.5.44. **klei-e/o-* ‘to lean against (intr.)’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Tocharian)	Compelling	Possible	^V Derivation

Indo-Aryan: Skt. *śráyate* ‘to lean against (intr.)’

Iranian: YAv. 3sg.pres.inj.med. *upa-sraiiata* ‘leaned upon (intr.)’

Baltic: Lith. *šliėti*, *-ja* ‘to lean, rest against’; Latv. *slīet*, *sleju* ‘to support, erect; lean against (tr.)’

Slavic: –

Arntz (1933: 57) listed the Indo-Iranian and Baltic thematic present formations from **klei-* ‘to lean against’ as an isogloss. This may be contrasted with the more widely attested nasal present from this root, cf. YAv. *ni-sirinaoiti* ‘to bring, assign’, Gr. κλίνω ‘to lean on, bend’, Lat. *dēclīnō* ‘to deviate, divert’, OHG *hlinēn* ‘to lean against’ (LIV: 332).¹⁷⁷ In Lithuanian, the root vocalism *-ie-* of the infinitive has been levelled throughout the paradigm (Smoczyński 2018: 1404). The acute accent in Baltic must be secondary (RR II: 430) and Latv. 1sg. *sleju* may reflect the original accentuation.

However, ToA *kālytār*, ToB *kaltār* ‘to stand’ may also be derived from **klei-e/o-* (LIV: 332; Ringe 1991: 152). Malzahn (2010: 593) and Peyrot (2013: 738) argue, based on ToA 1sg.pres.med. *kālymār*, that a root present should be reconstructed for Proto-Tocharian. Yet, it seems more likely that the thematic forms attested in both Tocharian A and B are old and that the athematic forms arose within Tocharian, since the palatalizing effect of the thematic vowel was neutralized due to the root-final **-i* (Friis forthc.).

One might envision the following scenario: in Proto-Indo-European, **klei-* formed an intransitive root aorist, to which an oppositional transitive nasal present **kl-ne-i-* was created. The thematic present reflected in Indo-Iranian, Balto-Slavic and Tocharian, in turn, may be seen as an oppositional intransitive to **kl-ne-i-*. The thematic stem **klei-e/o-* may reflect an innovation in these three branches, but could also be an archaism that was lost elsewhere.

3.5.45. **kok(H)olo-* ‘chip of wood’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation

Indo-Aryan: Skt. *śākala-* m./n. ‘chip, fragment, splint, log, piece’ (YV, TS+)

Iranian: –

Baltic: Lith. *šakalys* m. ‘chip of wood, splinter, pinewood’; Latv. *sakaļi* m.pl. ‘torches’

Slavic: –

Arntz (1933: 49) took the Sanskrit and Baltic words as a shared derivative in **-l-* from **kok^(w)-h₂-* ‘branch’, reflected in Skt. *śākhā-* f. ‘branch’, Goth. *hoha* m. ‘plough’, and Arm.

¹⁷⁷ Latv. *slīenu* ‘I lean’ may belong here but could just as well be an independent innovation.

c^{ax} ‘branch’. There are several problems with this etymology, however. First, Lith. *šakalỹs* and Latv. *sakaļi* are probably productive diminutive formations from Lith. *šakà* f. ‘branch’ etc. and need not be old. Skt. *śákala-*, on the other hand, may be unrelated to *śákhā-* given the unaspirated *-k-*. To connect them, one would have to assume that Skt. *śákala-* reflects **ké^(w)-o-* + *-lo-*, i.e., a different formation without the suffix **-h₂-*. A preform **ké^(w)-olo-* could not produce Lith. *šakalỹs*. Ultimately, the connection between the Sanskrit and Baltic words must be rejected.

3.5.46. **kor-H(-keh₂)-* ‘a kind of bird’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Greek)	Doubtful	Possible	^N Derivation

Indo-Aryan: Skt. *śāri-* f. ‘a kind of bird, *Gracula religiosa* (?)’ (YV+), *śārikā-* f. (Ep.+) ‘id.’

Iranian: MoP *sār*, *sārak* ‘starling’

Baltic: Lith. *šarka* f. ‘magpie’; OPr. *sarke* f. ‘magpie’ (EV)

Slavic: CS *svraka* f. ‘magpie’; Ru. *soróka* f. ‘magpie’; Pol. *sroka* f. ‘magpie’; SCr. *svrāka* ‘magpie’

Arntz (1933: 44) listed these words as an Indo-Slavic isogloss (cf. also EWAia II: 630). However, the words are difficult to separate from similar-looking bird names in other branches. While Arm. *sarik* ‘starling’ is likely an Iranian loanword (Hübschmann 1897: 236), Gr. *κόραξ* m. ‘raven’ could reflect **korh₂k-* (Beekes 2010: 750), which would make it formally very close to Balto-Slavic. Gr. *κορώνη* f. ‘crow’ and Lat. *cornix* f. ‘crow’ may be derived from an *n*-stem of the same root. Alb. *sórrë* f. ‘crow’, if inherited, could go back to **kuērneh₂-* and has been compared with SCr. *svrāka* etc. (Demiraj 1997: 355), although the Slavic forms that seem to reflect an anlaut **ku-* may be secondary (cf. Derksen 2008: 477). At any rate, it seems likely (with de Vaan 2008: 136) that we are dealing with an Indo-European onomatopoeic formation **kor-*, and there are no compelling arguments for taking the Indo-Iranian and Balto-Slavic forms as an isogloss.

3.5.47. **kun-ko/eh₂-* ‘dog-like; bitch’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Rejected	^N Derivation

Indo-Aryan: Skt. *śvaka-* m. ‘wolf’

Iranian: YAv. *spaka-* ‘dog-like’; MiP Pahl. *sag*, Man. *sg* ‘dog’; MoP *sag* ‘dog’; Psht. *spay* m. ‘dog’, *spəy* f. ‘bitch’

Baltic: –

Slavic: Ru. *suká* f. ‘bitch’; Pol. *suka* f. ‘whore’; Plb. *sauko* f. ‘whore’

Schmidt (1872: 49) and Arntz (1933: 49) listed the above words as an Indo-Slavic isogloss. However, it is unlikely that the Indo-Iranian and Slavic words reflect the same formation, for several reasons. First, the semantics are divergent. In Indo-Iranian, the *-ka-* suffix means

‘-like’, or is a diminutive, whereas in Slavic it is simply a female dog. Secondly, a reconstruction **k^hun-keh₂-* only accounts for part of the Slavic evidence, but not Pol. *suka* and Plb. *sauko* ‘whore’. In view of these considerations, I reject a direct comparison of the Indo-Iranian and Slavic words.

3.5.48. **kor-o-* ‘army’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Uncertain	Compelling	Rejected	^N Derivation

Indo-Aryan: –

Iranian: OP *kāra-* m. ‘army, people’; Bactr. *kaṇo* ‘people’

Baltic: Lith. *kāras, kārias* m. ‘war, army’; Latv. *kaŗš* ‘war, army’; OPr. *kragis* [*kargis*] m. ‘army’ (EV)

Slavic: –

Arntz (1933: 43–44) observed that Baltic and Iranian share an *o*-stem **kor-o-*, while Gr. *κοίρανος* m. ‘ruler, commander, lord’, OIr. *cuire* m. ‘troop, tribe’ and Goth. *harjis* m. ‘host, troop’ reflect **kor-io-* (LEW: 220; Derksen 2015: 226). However, Baltic also preserves the *io*-stem, as evidenced by Lith. *kārias*, indicating that both formations are inherited. The relationship between the *o*-stem and *io*-stem is unclear, as they appear to have the same meaning, but it seems difficult to exclude the possibility that the *io*-stem is derived from the *o*-stem, in which case the latter would be a shared archaism.

3.5.49. **krouh₂-io-* ‘corpse; flesh’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Germanic)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *kravyād-* adj. ‘eating flesh, corpses’ (RV+), *kravyá-* adj. ‘bloody’ (PS, TS)

Iranian: –

Baltic: Lith. *kraũjas* m. ‘blood’; OPr. *crauyo* f. ‘blood’ (EV), *krawia* f., *krawian* acc.sg.n. ‘blood’

Slavic: –

Arntz (1933: 44) listed this *io*-stem as an Indo-Slavic isogloss. However, these words cannot be separated from ON *hræ* n. ‘corpse, remains’, OE *hræ(w)*, *hrā(w)* n. ‘corpse, remains’ < PGm. **hraiwa-*, which derives from **hraiwa-* < **krou-io-* with metathesis (Kroonen 2013: 242). The Germanic cognate has not been taken into account in much of the literature on this etymology (e.g., Pinault 1982; EWAia I: 411; Wodtko, Irslinger & Schneider 2008: 444).

3.5.50. **kseub^h*- ‘to sway, swing’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Germanic)	Compelling	Rejected	Root

Indo-Aryan: Skt. *kṣobh-* ‘to stagger, begin to swing, tremble’

Iranian: YAv. *xšufsqn* 3pl.pres.subj. ‘they will tremble’

Baltic: Lith. *skubėti*, *skùba* ‘to hurry’, *skubús* adj. ‘hasty’; Latv. *skùbrs* ‘hasty’

Slavic: Cz. *chybatì* ‘to hesitate’; Pol. *chybać*, *chybam* ‘to sway, rock, run, rush’

Arntz (1933: 36) listed this root as an Indo-Slavic isogloss (see also LIV: 372). The Baltic forms have alternatively been connected to Goth. *af-skiuban* ‘to push away, reject’ under a reconstruction **skeub^h*- (LIV: 560). However, since **ks-* metathesizes to *sk-* in Germanic and Baltic, the forms may all reflect **kseub^h*- (Kroonen 2013: 444–45). The only reason to separate the Germanic root would be Slavic **skub-* in, e.g., SCr. *skúpsti* ‘to pluck out’, which Smoczyński (2018: 1214) connects to Lith. *skubėti* ‘to hurry’, but this is semantically remote and likely unrelated.

3.5.51. **kumēl-* ‘young (of animal)’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation

Indo-Aryan: Skt. *kumārā-* m. ‘child, son’

Iranian: –

Baltic: Lith. *kumėlė* f. ‘mare’, *kumelys* m. ‘stallion’; Latv. *kumele* f. ‘mare’, *kumelš* m. ‘stallion’

Slavic: –

Arntz (1933: 42) listed this stem as an isogloss (cf. also LEW: 309; EWAia I: 369). While the Sanskrit and Lithuanian forms are formally comparable, uniting them yields a rather obscure Indo-European reconstruction. To account for the long *-ā-* of *kumārā-* as opposed to the short *-ē-* of *kumėlė*, one would have to assume an ablauting stem **kum-el-*, which is implausible, since a root **kuem-* is otherwise unknown. Furthermore, it must be taken into account that *-elē/-elys* is a diminutive suffix in Baltic. Perhaps the Baltic words are rather to be compared with ORu. *komonь* ‘horse’ (Derksen 2008: 232) or Ger. *Hummel* ‘hornless ox, castrated bull’.

3.5.52. **k^weit-* ‘to perceive’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Germanic)	Compelling	Possible	Root

Indo-Aryan: Skt. *cet-* ‘to perceive, take notice of’, *céṭas-* n. ‘insight’

Iranian: OAv. *cōiθ-* ‘to perceive’

Baltic: Lith. *skaityti*, *skaito* ‘to read, count’; Latv. *šķist*, *šķitu* ‘to think, suppose’, *skaitīt*, *skaitu* ‘to count, recite, read’

Slavic: OCS *čisti*, *čbtq* ‘to count, read, honour’; Ru *čitát*, *čitaju* ‘to read’; Cz. *čísti*, *čtu* ‘to read’; SCr. *čísti* (13th–16th century AD) ‘to read’

The root **k^weit-* ‘to perceive’ has been explained as a *t*-extended variant of the synonymous **k^wei-* (LIV: 382). The enlarged variant, attested in nominal and verbal derivations in Indo-Iranian (EWAia I: 547–48) and Balto-Slavic (Derksen 2008: 89; Derksen 2015: 552–53), constitutes a possible Indo-Slavic isogloss, as suggested by Schmidt (1872: 49) and Arntz (1933: 40).

However, there are two problems with this etymology. First, the allegedly original root **k^wei-* is continued in OCS *čajati* ‘to expect, thirst for’ and SCr. *čājati* ‘to wait’, which corresponds to Skt. *cāya-* ‘to perceive’ and Gr. *τίω* ‘to esteem’. This verbal stem has been reconstructed as a so-called Narten-present **k^wěi-* (LIV: 377), but the Slavic acute points to **k^wehi-* (Derksen 2008: 78; cf. also Weiss 2017; Kümmel 2020), implying that the traditional analysis of **k^weit-* can hardly be maintained.

Second, besides Skt. *cet-* ‘to perceive’, there is the homophonous *cet-* ‘to shine’, reflected in, e.g., *citrá-* ‘shining’, *ketú-* m. ‘appearance’, which cannot be separated from PGM. **haidra-* ‘clear’ (Kroonen 2013: 200) and Goth. *haidu-* m. ‘way, manner’ (Lehmann 1986: 168). Since there is no evidence that *cet-* ‘to perceive’ and its cognates reflect a labiovelar, the two roots may be combined under a reconstruction **keit-*.¹⁷⁸ A semantic shift from ‘to be bright’ >> ‘to appear’ >> ‘to perceive’ is conceivable, cf. Eng. *shine* vs. Ger. *scheinen* ‘to shine; seem, appear’. If correct, this scenario implies that **keit-* not exclusively Indo-Slavic.

3.5.53. **k^(w)it-ti-* ‘thinking, consideration’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Rejected	^N Derivation

Indo-Aryan: Skt. *cítti-* f. ‘thinking, understanding’

Iranian: OAv., YAv. *cisti-* f. ‘consciousness’

Baltic: –

Slavic: OCS *čbstb* f. ‘honour, respect’; Ru. *čest’* f. ‘honour, respect’; Pol. *cześć* f. ‘honour, respect’; SCr. *čâst* f. ‘honour, respect’

¹⁷⁸ There is no need to assume delabialization of **k^w* in Germanic, which in any case did not occur before **o* (cf. Kroonen 2013: xxxii)

Although this root is not an Indo-Slavic isogloss (see p. 154), a *ti*-abstractum is only found in Indo-Iranian (EWAia I: 547–48; AirWb.: 598) and Slavic (Derksen 2008: 94), which was listed as an isogloss by Arntz (1933: 44). However, in Sanskrit, practically every root has a corresponding *ti*-stem (AiGr. II, 2: 622–28). Given the transparent semantics in relation to the verb *cet-* ‘to perceive’, it may be a productive formation. Similarly, OCS *čbstb* ‘honour, respect’ is semantically close to the corresponding verb *čisti* ‘to count, read, honour’.

3.5.54. **kʷu-dʰe* ‘where’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Anatolian, Italic)	Compelling	Rejected	^N Derivation

Indo-Aryan: Skt. *kúha* ‘where’

Iranian: OAv. *kudā* ‘where’

Baltic: –

Slavic: OCS *kъde* ‘where’

Porzig (1954: 168) claims that the formation **kʷu-dʰe* is exclusive to Indo-Iranian and Slavic. However, it is impossible to exclude Lat. *ubī*, Osc. *puf*, Umbr. *pufe* ‘where’ as cognates, even though they could alternatively reflect **kʷu-bʰei* (de Vaan 2008: 636). A further possible cognate is Lyd. *kud* ‘where’ (Kloekhorst 2008: 490), in which case the formation could be Proto-Indo-Anatolian.

3.5.55. **leh₁ǵʰ-* ‘to crawl; to go’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	Root

Indo-Aryan: –

Iranian: YAv. *vī-rāzaiti* ‘to boast, brag’; Khot. *rrāys-* ‘to cry out (of birds)’; Bactr. *pač-* ‘to call, name’

Baltic: Latv. *lēzēt*, *lēzēju* ‘to go slowly, slide’; OPr. *līse* 3sg. ‘crawls’

Slavic: OCS *izlēšti*, *izlēzō* ‘to go out of’; Ru. *lezt’*, *lézu* ‘to climb, crawl, drag oneself along’; Pol. *leźć*, *lezeć* ‘to climb, crawl upwards, drag oneself along’; SCr. *ljěsti*, *ljěžēm* ‘to crawl, climb’

Meillet (1926: 171) argued that OCS *izlēšti* and its Balto-Slavic cognates, which reflect **leh₁ǵʰ-* (cf. Derksen 2008: 275–76; LIV: 400), are related to YAv. *vī-rāzaiti*, which Bartholomae glosses as ‘gehen’ (AirWb.: 1526). However, Kellens (1995: 57) glosses the Avestan verb as ‘fanfaronner’, i.e., ‘to boast, brag’, which fits better with its cognates in Khotanese and Bactrian (cf. Cheung 2007: 306–7). The Balto-Slavic words have often been connected to ON *lāgr* ‘low’ < PGm. **lēgu-* but this is more likely derived from PGm. **leg(j)an-* < **legʰ-* (Kroonen 2013: 330).

Although the Iranian and Balto-Slavic verbs are formally comparable and lack convincing cognates in other branches, the etymology is semantically unconvincing.

3.5.56. **loip-eie/o-* ‘to smear, stick’; **li-n-p-e/o-* ‘to smear, stick’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Germanic)	Rejected	Rejected	^V Derivation

Indo-Aryan: Skt. *lepayati* ‘to cause to smear; to smear, anoint’ (Suśr.), *limpāti* ‘to besmear, adhere to, deceive’

Iranian: –

Baltic: Lith. *lipinti*, *-ina* ‘to glue, stick’, *lipti*, *liṃpa* ‘to stick’

Slavic: OCS *prilēpiti*, *prilēpljǫ* ‘to stick’; Ru. *lepít’*, *lepljú* ‘to model, mould, stick’; Pol. *lepić*, *lepię* ‘to glue, stick’; SCr. *lijèpiti*, *lĭjepīm* ‘to cover with clay’

Arntz (1933: 54) listed these causative formations as an isogloss, but this conclusion cannot be maintained. First, Goth. *bi-laibjan* ‘to leave behind’ (cf. Kroonen 2013: 323) is formally identical, although it may well be an independent formation given the divergent semantics. For formal reasons, Lith. *lipinti* must be an independent formation, as it is derived from *lipti* ‘to be sticky, stick’ (Smoczyński 2018: 711–12). Second, Skt. *lepayati* ‘to besmear’ is attested late (Suśr.) and may be a recent formation. In terms of semantics, it is divergent from the Slavic causative, which indicates independent formations.

In addition to the causative, it has been argued that only Baltic and Sanskrit reflect an inherited nasal present, whereas other nasal formations, viz. Gr. *λαίνω* ‘to make fat, anoint’, OCS *pri-lbnǫti* ‘to stick’, Goth. *af-lifnan* ‘to be left over’ and ToA *lipñat* ‘you will be left over’ are independent innovations (LIV: 408). Thus, the thematicized nasal present of Baltic and Sanskrit could be seen as a shared innovation. However, the semantics of the formations are different (Skt. *limpāti* is transitive whereas Lith. *lipti* is anticausative) and the Lithuanian formation belongs to a productive class (Villanueva Svensson 2011). This indicates that they are independent innovations.

3.5.57. **l(o)uk-i-* ‘light’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation

Indo-Aryan: Skt. *rúci-* f. ‘splendour, light’ (AV+)

Iranian: –

Baltic: OPr. *luckis* m./f. ‘firewood, spill’ (EV)

Slavic: RuCS *lučb* m. ‘ray, light, shining’; Ru. *luč* m. ‘ray, beam, (dial.) torch’; Cz. *louč* f. ‘torch’; SCr. *lŭč* m./f. ‘torch, light, ray’

Arntz (1933: 48) listed this *i*-stem from **leuk-* ‘to become bright’ as an Indo-Slavic isogloss. However, the root ablaut and stem variation within Balto-Slavic rather points to a root noun, cf. Skt. (RV+) *rúc-* f. ‘light, splendour, lustre, appearance’, Lat. *lūx* f. ‘light’. The etymology is therefore not compelling.

3.5.58. **loup-eie/o-* ‘to tear (off), peel’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Uncertain	Rejected	Rejected	^v Derivation

Indo-Aryan: Skt. *lopayati* ‘to cause to break’ (Br.+), *ropayati* ‘to cause to suffer’ (PS)

Iranian: –

Baltic: Lith. *laupýti*, *laũpo* ‘to tear off’, Latv. *lāupīt*, *lāupu* ‘to peel, rob, plunder’

Slavic: Ru. *lupít’*, *lupljú* ‘to peel (off)’; Pol. *lupić*, *lupię* ‘to plunder, loot’; SCr. *lúpiti* ‘to clean, peel’

Arntz (1933: 53) listed this causative stem as an Indo-Slavic isogloss. However, it is far from certain that the Sanskrit forms belong to the Indo-European root **leup-* ‘to peel (off)’, which is the basis of the Balto-Slavic forms. In fact, Skt. *lop-* is generally derived from **Hreup-* ‘to break’ (EWAia II: 482), cf. ON *reyfa* ‘to break, tear; rob’ < **raubjan-* (LIV: 511), which is a better fit semantically. Possibly, Skt. *lop-/rop-* is a conflation of **leup-* and **Hreup-*, but the *eie/o-* stem in Sanskrit is more likely from **Hreup-*.

3.5.59. **mei(H)-e/o-* ‘to (ex)change, switch’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^v Derivation

Indo-Aryan: Skt. 3pl.pres.med. *ví mayante* ‘they alternate’

Iranian: YAv. *maiiaŋ* ‘?’

Baltic: Latv. *mīt*, *miju* ‘to exchange’

Slavic: –

Arntz (1933: 55) listed this thematic present as an isogloss (cf. also LIV: 426; Derksen 2015: 544). However, Latv. *mīt*, *miju* has zero-grade in the root, which precludes a direct comparison to Indo-Iranian. Moreover, the origin of the Latvian intonation is unclear. Derksen (2015: 544) argues that the broken tone is an innovation, whereas Smoczyński (2018: 739) reconstructs **meiH-*. The latter is incompatible with Indo-Iranian, as the root is *aniŋ*, cf. Skt. *apa-mītya-* n. ‘loan, debt’.

3.5.60. **mor-o-* ‘plague’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Greek)	Compelling	Rejected	Semantics

Indo-Aryan: Skt. *māra-* m. ‘death, plague’ (VarBṛS, AVPariś), *pramará-* m. ‘death’ (RV), *mara-* m. ‘death’

Iranian: –

Baltic: Lith. *māras* m. ‘plague, death’

Slavic: OCS *morъ* m. ‘plague, death’; Ru. *mor* m. ‘plague’; Pol. *mór* m. ‘plague’; SCr. *môr* m. ‘death, plague’

Porzig (1954: 166) argues that the specific meaning ‘plague’ justifies separating Indo-Slavic **mor-o-* ‘plague’ from Gr. $\mu\acute{o}\rho\omicron\varsigma$ ‘doom, death’. See also Arntz (1933: 51) and LEW: 409. However, a closer look at the Sanskrit evidence casts doubt on the translation of *māra-* as ‘plague’, which probably stems from Monier-Williams (1899: 811). In the AVPariś, *māra-* is attested in three compounds: *śiśu-māra(ka)-* ‘(South Asian river) dolphin’ (lit. ‘child-killer’), *bubhukṣā-māra-* ‘death of desire, hunger’, and *jana-māra-* ‘plague’ (lit. ‘people-killer’). In VarBr̥S, we find *kṣut-māra-* ‘famine’ (lit. ‘death by hunger’). Thus, *māra-* only means ‘plague’ in the compound *jana-māra-*, whereas in earlier attestations, e.g., AV *kṣudhā-mārā-* ‘death by starvation’, it means simply ‘death’. This indicates that the meaning ‘plague’ is not a shared innovation with Balto-Slavic, and that Gr. $\mu\acute{o}\rho\omicron\varsigma$ cannot be separated from this etymon.

3.5.61. **mud-ro-* ‘cheerful, lively’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation

Indo-Aryan: Skt. *mudrá-* adj. ‘happy’

Iranian: –

Baltic: Lith. *mudrūs, mūdras* adj. ‘quick, valiant, smart, arrogant’; Latv. *mudrs* ‘quick, lively, cheerful’

Slavic: –

Arntz (1933: 51) listed this *ro*-adjective as an isogloss. The Sanskrit and Baltic words have traditionally been compared (EWAia II: 383; LEW: 467; Smoczyński 2018: 825–26). However, the etymology is formally problematic, since Baltic does not show the effects of Winter’s Law. According to Rasmussen (1999: 537), Winter’s Law did not operate before resonants, but there are several counterexamples, e.g., Lith. *ūdra* f. ‘otter’ < **udreh₂-* (see further Derksen 2002: 8).

3.5.62. **neiǵ^h-o-* ‘itching, disease’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation Root

Indo-Aryan: –

Iranian: YAv. *naēza-* m. ‘a sickness; lumps, mushy mass’; Oss. I *nīz* / D *nez* ‘disease’

Baltic: Lith. *niežaĩ* m.pl. ‘scabies’, *niēžas* m. ‘itch mite, scabies, ulcer’, *niežėti* ‘to itch’; Latv. *naīza* f., *naīzs* m. ‘scabies’, *niēzt* ‘to itch’

Slavic: –

Arntz (1933: 39) listed YAv. *naēza-* ‘a sickness’ and Lith. *niežaĩ* ‘scabies’ as an isogloss, which can be united under a reconstruction **neiǵ^h-o-*. Fraenkel (1962: 502) tentatively

compares Arm. *anic* ‘nit, louse egg’, but this rather belongs with Gr. κović f. ‘eggs of lice, fleas, bugs’ (Beekes 2010: 747).

The Baltic words clearly derive from a verbal root reflected in Lith. *niežėti* ‘to itch’. Latvian *niēzt* ‘to itch’ has an acute root that is reflected in some but not all nominal derivatives (Smoczyński 2018: 863). This could be secondary but no explanation has been presented.

Oss. I *nīz* / D *nez* ‘disease’ seems to be a general designation of sickness which can be specified to certain body parts, e.g., *særnīz* ‘headache, migraine’ (Abaev II: 186). YAv. *naēza-* denotes an unknown disease and is as such difficult to assess. Perhaps the meaning is derived from the homonymous *naēza-* m. ‘lumps, mushy mass’. YAv. *naēza-* n. ‘sharp point (of a needle)’ is another possible root cognate, but it is semantically closer to Skt. *nikṣ-* ‘to pierce’. In any case, there is no indication that the Iranian words have anything to do with ‘to itch’, which makes the comparison with Baltic unconvincing.

3.5.63. *oti-loik^w-o- ‘leftover, surplus’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Greek)	Rejected	Rejected	^N Derivation

Indo-Aryan: Skt. *atireka-* m. ‘abundance, surplus’

Iranian: Bactr. αδοριγο m. ‘PN’ (?)¹⁷⁹

Baltic: Lith. *ātlaikas* m. ‘remnant, leftover’

Slavic: OCS *otbĕkъ* m. ‘remnant, leftover’

These Sanskrit and Balto-Slavic compounds were taken as an isogloss by Arntz (1933: 56) and Porzig (1954: 167). However, since Skt. *āti-* corresponds to Gr. *έτι*, Lat. *et* and Goth. *ip* (EWAia I: 57), whereas the Balto-Slavic prefix has *o*-grade but no final *-i*, the formations cannot be compared directly, and are most likely independent. Both compounds contain *loik^w-o-, which is also reflected in Gr. λοιπός ‘remaining’.

3.5.64. *ped-ti- ‘walking on foot’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Rejected	^N Derivation

Indo-Aryan: Skt. *pattī-* m. ‘pedestrian, foot soldier’

Iranian: OP *pasti-* m. ‘foot soldier’; Oss. I *fistæg* / D *fest(æg)* ‘pedestrian’

Baltic: Lith. *pėsčias* adj. ‘pedestrian, walking on foot’

Slavic: OCS *pěšb* adj. ‘on foot’; Ru. *pěšij* adj. ‘on foot’; Pol. *pieszy* adj. ‘on foot’; SCr. *pjěše* adv. ‘on foot’

Skt. *pattī-* and Lith. *pėsčias* have been derived from a stem *ped-ti-, which is not found in other branches (LEW: 562; EWAia II: 74). In earlier accounts, the Lithuanian acute is explained from a lengthened *ē, but Derksen (2015: 353) considers it as a result of Winter’s

¹⁷⁹ Cf. Sims-Williams (2007: 188); the interpretation is not certain.

Law. It is possible that Winter's Law would have been blocked in a cluster **dt* (due to early assimilation to **tt*), but in any case, the acute could easily have been restored at a later date (after, e.g., Lith. *pėdà* f. 'foot, footstep').

The etymology cannot be maintained, however, since Lith. *pėsčias* is clearly derived from *pėstas* 'on foot', like *stāčias* 'standing' from *statūs* 'standing' (cf. Smoczyński 2018: 951) or *mesčias* 'restrained, moderate' from *mėstas* m./adj. 'measure; restrained, moderate'. The Slavic forms reflect **pěšb* < **ped-sio*-¹⁸⁰ (Vasmer II: 353; Derksen 2008: 398) and thus cannot be directly compared to Skt. *pattī*-. The Slavic stem **ped-sio*- could perhaps be understood as deriving from an *s*-stem **ped-os*-, although no such form is attested. Possibly, Lith. *pėstas* could be derived from **ped-s(i)o*- as well, if we assume metathesis of **ds* > *st*, since **-Ts*-clusters are not tolerated in Baltic (Tijmen Pronk, p.c.).

Since the derivation of Lith. *pėsčias* from *pėstas* is a Baltic process, which does not involve a *ti*-stem, a shared innovation with Indo-Iranian must be rejected.

3.5.65. **pě(n)s-(n)u*- 'dust, sand'

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation Root

Indo-Aryan: Skt. *pāṃsú*- m. 'dust, sand'

Iranian: YAv. *pąsnu*- m. 'dust'; Khot. *phāna* 'dust, mud'; Oss. I *fənyk* / D *funuk* 'ash'

Baltic: –

Slavic: OCS *pěsъkъ* m. 'sand'; Ru. *pesók* m. 'sand'; Pol. *piasek* m. 'sand'; SCr. *pijèsak* m. 'sand'

Schmidt (1872: 48) and Arntz (1933: 36) listed the above Indo-Iranian and Slavic words as an isogloss. However, the etymology is now considered uncertain (EWAia II: 114–15). In fact, the Indo-Iranian words are difficult to unite under single Proto-Indo-Iranian form. Assuming that Sogd. B *spn* 'k' 'dirt, filth' does not belong here, the Avestan, Khotanese and Ossetic words can probably all be derived from **pansnu*- (Kümmel 2012b), but the varying suffix *vis-à-vis* Skt. *pāṃsú*- remains unexplained. The variation within Indo-Iranian points to post-Proto-Indo-Iranian loanwords. Even if the inner-Indo-Iranian variation is taken as secondary, the Sanskrit and Avestan forms have an **-n*- in the root, which is not reflected in Slavic. The words may be indirectly connected as independent borrowings, but can hardly go back to a putative Indo-Slavic stage.

¹⁸⁰ Just like in the case of Lith. *pėsčias*, the effect of Winter's Law may have been analogically restored, if it was regularly blocked in this environment. Forms like Cz. *pěchý* 'on foot' and Ru. *pexóta* 'infantry' are secondary (cf. Vasmer II: 350).

3.5.66. **perg^(w)enio-* / **perk^(w)uHno-* ‘a (thunder) god’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Uncertain ¹⁸¹	Rejected	Possible	Root

Indo-Aryan: Skt. *parjanya-* m. ‘rain cloud, rain, rain god’

Iranian: –

Baltic: Lith. *perkūnas* m. ‘thunder, thunder god’

Slavic: ORu. *perunъ* m. ‘a god’

Meillet (1926: 171) mentions this word as an isogloss, but does not comment on the formal problems. EWAia (II: 96-97 with lit.) does not completely rule out the possibility that Skt. *parjanya-* reflects older **parc-anya-*, following a taboo deformation. At best, the words may then contain the same root, but even this is highly speculative.

3.5.67. **post-sk^(w)(-eH)* ‘behind, after, afterwards’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Rejected	^N Derivation

Indo-Aryan: Skt. *paścā* adv. ‘behind, after, later’, *paścāt* adv. ‘from behind, backwards’

Iranian: YAv. *pasca* adv. ‘after, behind’, *paskāt* adv. ‘from behind’

Baltic: Lith. *paskuĩ*, *pāskui*, *pāsakui* adv. ‘behind, backwards, later, afterwards’

Slavic: –

Schmidt (1872: 48) takes this adverb as an isogloss, arguing that Lat. *post* ‘behind, after’ is unrelated. However, while it lacks the suffix **-sk^(w)-*, it is likely that Lat. *post* contains the same root as Skt. *paścā* (cf. de Vaan 2008: 483–84). The derivation in **-sk^(w)-* would then be the potential Indo-Slavic isogloss. However, Lith. *paskuĩ* and the variant *pāsakui* seem to be derived within Baltic from *pasèkti* ‘to follow’, by analogy to *viduĩ* ‘inside, within’ (Smoczyński 2018: 918; Hock et al. 2019: s.v. *paskuĩ*). The formations should therefore be regarded as independent.

¹⁸¹ The question regarding a possible link between Lith. *perkūnas* and Lat. *quercus* f. ‘oak’ etc. will not be treated here.

3.5.68. **poti*- ‘self’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Rejected	Semantics

Indo-Aryan: –

Iranian: YAv. *xʷaē-paiti*- adj. ‘himself, herself’, *xʷaē-paiθiia*- adj. ‘own’; OP *uvaipašiya*-adj. ‘own’

Baltic: Lith. *pàts*, OLith. *patìs* m. ‘husband; self’, *pàt* adv. ‘self, just’; Latv. *pats* m. ‘husband; self’, *pat* adv. ‘self, just’

Slavic: –

Meillet (1926: 167) argues that Iranian and Baltic share a semantic development in PIE **poti*- ‘husband, master’, which in both branches is also used in the meaning ‘self’. However, in Iranian, *paiti*- only means ‘self’ in a compound with *xʷaē*- < **suai*- (see AirWb.: 1860–61), which likely means that it developed independently from Baltic.

Fraenkel (LEW: 552), on the other hand, suggests that **poti*- originally meant ‘self’, from which ‘lord, husband’ subsequently developed. Since the latter meaning is widespread in Indo-European, this scenario implies that the Baltic-Iranian correspondence is an archaism. In line with this etymology, it has been proposed that **poti*- is an inflected enclitic particle **-pot* ‘exclusively, specifically’, reflected in Hitt. =*pat* ‘the same, self, exclusively’ (Pinault 2021), but the lenis stop of Hittite is incompatible with PIE **p* (Kloekhorst 2008: 653).

3.5.69. **prh₂-uo*- ‘first, foremost’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Tocharian, Germanic)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *pūrva*- adj. ‘first, foremost’

Iranian: YAv. *pauruua*- adj. ‘foremost, first, previous’

Baltic: (Lith. *pirmas* adj. ‘first’; Latv. *pirmais* adj. ‘first’; OPr. *pirmas*, *pirmois* adj. ‘first’)

Slavic: OCS *prvъ* adj. ‘first’; Ru. *pérvyj* adj. ‘first’; Pol. *pierwszy* adj. ‘first’; SCr. *pŕvī* adj. ‘first’

Schmidt (1872: 48) and Meillet (1926: 172) claim that only Balto-Slavic (Derksen 2008: 430) and Indo-Iranian (EWAia II: 157; AirWb.: 870–72) reflect a stem **prh₂-uo*- ‘first’, which was later replaced by **prh₂-mo*- in Baltic. However, ToA *pārwat* ‘first’, with secondary *-t* after other ordinals, cannot be separated from this cognate set (Adams 2013: 383). OE *forwost*, *forwest* m. ‘chief, captain’ may also be derived from a Germanic reflex of **prh₂-uo*- (IEW: 810–16; Holthausen 1934: 113). Alb. *pārë* ‘first’ has been derived from **prh₂-uo*-, but since CRHC-clusters regularly yield Albanian CRaC (cf. de Vaan 2018: 1738), this is impossible. Demiraj (1997: 311) mentions that **prh₂-u*- could account for Alb. *pārë*, but the easiest solution (thus also Orel 1998: 311) is that it is derived within

Albanian from Alb. *para* / *pár(ë)* ‘before, previous, forth’ < **prH-os* ‘former’, also reflected in Gr. *πάρως* ‘before, formerly’, Skt. *purás* ‘forth, before’.

3.5.70. **pusk-o-* ‘flower; tuft’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation

Indo-Aryan: Skt. *púṣkara-* n. ‘lotus flower’

Iranian: –

Baltic: Latv. *pusks* m. ‘tuft’

Slavic: –

Arntz (1933: 55) listed these words as an Indo-Slavic isogloss, including Lith. *pùškas* ‘pimple, blister’, which is unrelated (cf. Smoczyński 2018: 1046). Skt. *púṣkara-* has been derived from *poṣ-* ‘to bloom, thrive’ < **h₃peus-* (EWAia II: 152; LIV: 303). Based on this, it would be possible to postulate a stem **pus-ko-* that is shared with Latvian. However, the formation is obscure, since *-ka-* is not a primary nominal suffix in Indo-Iranian. Together with Skt. *púṣpa-* ‘flower’, *púṣkara-* could be seen as a non-Indo-European loanword (cf. Lubotsky 2001b: 305).

3.5.71. **seu-io-* ‘left’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Celtic, Tocharian)	Compelling	Possible	^N Derivation

Indo-Aryan: Skt. *savyá-* adj./m. ‘left; left hand’

Iranian: YAv. *haoiia-* adj. ‘left’

Baltic: –

Slavic: CS *šui* adj. ‘left’; Sln. *šúj* adj. ‘left’

The correspondence between Indo-Iranian (EWAia II: 716; AirWb.: 1736) and Slavic (Derksen 2008: 487–88) is taken as an isogloss by Arntz (1933: 36) and Porzig (1954: 168). However, the words cannot be separated from MWelsh *aswy*, *asw* ‘left, sinister, clumsy’, MBret. *hasou* ‘left’, which go back to a prefixed form **ad-seu-io-* (Matasović 2009: 44). Matasović (2009: 360) suggests that the Celtic words may be derived from PCelt. **suwo-* ‘to turn, wind’, but there is no compelling reason to reject the connection to Skt. *savyá-*. A further possible cognate is ToB *saiwai* (indecl.) ‘left’, if derived with metathesis from **sou-io-* (Adams 2013: 767).

3.5.72. **(s)poh₁i-men-* ‘foam’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Italic, Germanic)	Compelling	Rejected	^N Derivation

Indo-Aryan: Skt. *phéna-* m. ‘foam, froth’

Iranian: MoP *fīn* ‘snot’, *fīnak* ‘sea foam’; Sogd. B *pym’kh* ‘foam, froth’; Oss. I *fynk* / D *fīnkæ* ‘foam’

Baltic: Lith. (dial.) *spáinė* f. ‘foam (on waves)’; OPr. *spoayno* f. ‘foam (of fermenting beer)’

Slavic: OCS *pěny* f.pl. ‘foam’; Ru. *péna* f. ‘foam’; Pol. *piana* f. ‘foam’; SCr. *pjèna* f. ‘foam’

Schmidt (1872: 48) and Arntz (1933: 49) listed this stem as an Indo-Slavic isogloss. For the attested forms, see EWAia II: 204, Abaev I: 498, and Derksen (2008: 397; 2015: 418). These words cannot be separated from Lat. *spūma* f. ‘foam’ and PGm. **faima(n)-* m. ‘foam’, however (cf. Kroonen 2013: 123–24). Porzig (1954: 166) argued that Indo-Iranian and Balto-Slavic share a simplification of the cluster **-mn-* > **-n-*, whereas Latin and Germanic show a different dissimilation of **-mn-* > **-m-*. However, the cluster simplification **-mn-* > **-n-* was a Proto-Indo-European development, conditioned by a labial in the root, cf. PIE **b^hud^h-mēn-*, gen. **b^hud^h-(m)n-os* ‘bottom’ > (Pre-)PGm. **budmē*, gen. **buttaz*, Lat. *fundus* m., Skt. *budhná-* m. (cf. AiGr. II, 2: 766; Kroonen 2006). This suggests that Lat. *spūma* and PGm. **faima(n)-* levelled the strong stem of **(s)poh₁i-men-* throughout the paradigm.

Thus, rather than the dissimilation itself, it is the generalization of the dissimilated weak stem that is a potential Indo-Slavic isogloss. This cannot be a shared innovation, however. Within Iranian, there is variation between forms with **-m-* (Sogd. B *pym’kh* ‘foam, froth’) and **-n-* (e.g., Oss. I *fynk* / D *fīnkæ* ‘foam’), showing that the athematic paradigm must have been retained into Proto-Iranian. Furthermore, the aspiration in Sanskrit and fricativization in Iranian point to PIIt. **pHai-na-*, whereas the Balto-Slavic acute points to **(s)poh₁i-neh₂-* (cf. Lubotsky 2011: 115).

3.5.73. **tek^w-* ‘to run (of water), flow’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Tocharian)	Compelling	Possible	Semantics

Indo-Aryan: Skt. *tak-* ‘to run (of animals, rivers)’

Iranian: YAv. *tak-* ‘to run (of animals), flow (of water)’

Baltic: Lith. *tekėti*, *tēka* ‘to run, flow’

Slavic: OCS *tešti*, *tekō* ‘to flow, run’; ORu. *teči*, *teku* ‘to flow, move, run’; Pol. *ciec*, *ciekę* ‘to flow, run’; SCr. *tèći*, *tèčēm* ‘to flow, run’

The root **tek^w-* is well attested and possibly Indo-Anatolian, cf. Hitt. *uatku-* ‘to jump, flee’ (Kloekhorst 2008: 990). Other cognates include OIr. *teichid* ‘to flee’ and Alb. *ndjek* ‘to

follow, pursue’ (LIV: 620). Although a verbal stem is attested in other branches (*pace* Schmidt 1872: 49), Porzig (1954: 167) argues that Indo-Iranian and Balto-Slavic share a semantic development from ‘to run, flee’ > ‘to flow’ (EWAia I: 610; AirWb.: 624–26; LEW: 1074; Derksen 2008: 489; 2015: 462). However, ToB *cake* n. ‘river’ < **tek^w-os-* must now be adduced (Adams 2013: 267), with **k^w* > *k* before **o*, which shows that the meaning ‘to flow’ is not exclusive to Indo-Iranian and Balto-Slavic.

3.5.74. **t(e)nH-u-ko-* ‘thin’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Rejected	^N Derivation

Indo-Aryan: Skt. *tanuka-* adj. ‘thin’ (Car.), *tanú-* adj. ‘thin’

Iranian: MiP Pahl. *tanuk* adj. ‘thin, shallow’; MoP *tanuk* adj. ‘thin, shallow’

Baltic: –

Slavic: Ru. *tónkij* adj. ‘thin, slender, fine’; Pol. *cienki* adj. ‘thin, slender, fine’; SCr. *tānak* adj. ‘thin, slender, fine’

A *u*-stem adjective **t(e)nH-u-* may be reconstructed for Proto-Indo-European, cf. Skt. *tanú-*, Lith. *tėvas*, Lat. *tenuis*, Gr. *ταναός*, OIr. *tanae* ‘thin’, but the *ko*-suffixed variant is a potential Indo-Slavic isogloss, as recognized by Arntz (1933: 46). In Slavic, *u*-stem adjectives were consistently extended by **-ko-/ke-*, however (Langston 2018: 1545). Given that Slavic reflects a zero-grade in the root (Derksen 2008: 505), whereas Lith. *tėvas* (LEW: 1086) has *e*-grade, we must reckon with an ablauting stem in Proto-Balto-Slavic. With this in mind, it seems unlikely that the thematicization by **-ko-* happened before the separation of Baltic and Slavic. It cannot be determined whether Indo-Iranian had root ablaut, since the zero-grade **tnH-u-* would have merged with the full grade. However, Skt. *tanuka-* is attested late beside the older, unenlarged *tanú-* (EWAia I: 620–21). Thus, the evidence suggests that the *ko*-extensions are independent innovations.

3.5.75. **tetk-* ‘to cut, hew, carpenter’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Rejected	^V Derivation

Indo-Aryan: Skt. 3sg.pres.ind. *tāṣṭi* (AB), 3pl. *tākṣati* ‘to carpenter, hew, fashion’ (RV)

Iranian: OAv. 3sg.pres.ind. *°tāṣti*, 3sg.pres.inj. *tāšt* ‘to fashion, make’; Sogd. *t’š-* ‘to cut’; Khot. *ttāṣ-* ‘to cut’

Baltic: Lith. *tašýti*, *tāšo* ‘to hew’; Latv. *test*, *tešu* ‘to hew, smoothen, beat’

Slavic: OCS *tesati*, *tešq* ‘to hew’; Ru. *tesát’*, *tešú* ‘to hew’; Pol. *ciosać*, *ciosam* ‘to hew’; SCr. *tèsati*, *těšēm* ‘to cut, trim, polish’

Meillet (1926: 172) and Arntz (1933: 46) observed that verbal stems from the root **tetk-* are only attested in Indo-Iranian (EWAia I: 612; AirWb.: 644–45) and Balto-Slavic

(Derksen 2015: 459).¹⁸² Traditionally, Lat. *texō* ‘to weave’ has also been derived from **tetk-* (IEW: 1058–59), but it is nowadays instead reconstructed as **teks-* (LIV: 619) or **teks-* (de Vaan 2008: 619) and compared to Hitt. *takš-^{zi}* ‘to devise, unify, undertake, mingle’, originally ‘to put together’ (Kimball 1999: 258).

While verbal stems from **tetk-* are restricted to Indo-Iranian and Balto-Slavic, the root is also found in Gr. τέκτων m. ‘carpenter, manufacturer, artist’, cognate with Skt. *tákṣan-* m. ‘carpenter’ and Av. *tašan-* m. ‘creator’.¹⁸³ Nominal derivatives in other branches like OHG *dehsala* f. ‘axe’ and OIr. *tál* m. ‘axe’ < PCelt. **tāxslo-*, may be derived from either **teks-* or **tetk-*.

The ablaut in the paradigm of Skt. 3sg. *tāṣṭi* (AB),¹⁸⁴ 3pl. *tákṣati* (RV) is rare, and has been argued to continue a Proto-Indo-European static paradigm with an alternation of **é* and **ē* in the root (Narten 1968). However, if we examine the reconstructed paradigm of Skt. *tāṣṭi*, two features stand out: 1) in the 3sg. **té(t)k-ti*, the apparent lengthened grade coincides with loss of **-t-* in the root, and 2) in the 3pl. **tétk-nti*, **-t-* is retained, and the zero-grade ending **-nti* is used, which is otherwise only found in reduplicated presents. Rather than root ablaut, this suggests that the stem was originally reduplicated, i.e., 3sg. **té-tk-ti*,¹⁸⁵ 3pl. **té-tk-nti*. In the singular, **-t-* was lost with compensatory lengthening in the cluster **-tk-*. This did not happen in the plural, where the cluster **-tkn-* was tolerated because the **ŋ* was vocalic.¹⁸⁶ This scenario implies that **tetk-* is a secondary root from **teḱ-*, extracted from a reduplicated verbal stem. As such, the existence of nominal derivatives from the secondary root **tetk-* in Greek (τέκτων), as well as possibly Celtic and Germanic, presupposes the previous existence verbal stems from **tetk-* in Proto-Indo-European. Therefore, the shared Indo-Slavic preservation of verbal stems from **tetk-* must be an archaism.

3.5.76. **teuh₂-* ‘to become fat’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Compelling	Rejected	^v Derivation

Indo-Aryan: Skt. *út tavīti* ‘to become strong’

Iranian: OAv. *tauuā* 1sg.pres.subj.act. ‘I will be able’

Baltic: –

Slavic: RuCS *tyti* ‘to become fat’; Pol. *tyć, tyje* ‘to become fat’; SCr. *ṭiti* ‘to become fat’

Verbal forms of the root **teuh₂-* are only attested in Indo-Iranian and Slavic (LIV: 639–40), which constitutes a potential isogloss. The root can hardly be separated from **teuk-*,

¹⁸² It should be noted that no direct stem cognates are attested, but the Balto-Slavic forms may ultimately be derived from the same paradigm as Skt. 3sg. *tāṣṭi*, 3pl. *tákṣati*. The Balto-Slavic forms can technically be derived directly from **teḱ-*, cf. Gr. aor. ἔτεκον ‘bore, begat’, but they are semantically closer to **tetk-* to cut, hew, carpenter’.

¹⁸³ Arm. *hiwsn* ‘carpenter’ is often adduced but does not belong here (cf. Martirosyan 2010: 410).

¹⁸⁴ Despite the relatively late attestation, *tāṣṭi* must be archaic in view of OAv. 3sg.inj. *tāšt*, YAv. 3sg.pres. *tāṣti*.

¹⁸⁵ This form is admittedly problematic, as the expected ablaut in 3sg. of a reduplicated present would be **te/i-teḱ-*.

¹⁸⁶ Cf. Kortlandt (2004 apud Lubotsky, p.c.). For a similar account of the origin of **teḱ-*, see LIV: 638 (with lit.), although here an original reduplicated aorist is assumed, from which a Narten present was derived.

reflected in Lith. *tùkti* ‘to become fat’, nor from **tuem-*, reflected in Lat. *tumēscō* ‘to swell’. Although the origin of these root variants is unclear, they seem to be connected to the verbal system, cf. **g^wem-* vs. **g^weh₂-* ‘to go’. Accordingly, it is likely that the nominal formations from **teuh₂-*, e.g., Gr. τᾶς ‘great, much’, are ultimately deverbal, and that the corresponding verbal formations were lost in other branches. This implies that the Indo-Slavic verbal stems from **teuh₂-* are archaisms.

3.5.77. **tok^w-o-* ‘course’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation

Indo-Aryan: –

Iranian: YAv. *taka-* m. ‘running, course’

Baltic: Lith. *tākas* m. ‘(foot-)path’; Latv. *taks* m. ‘(foot-)path’

Slavic: OCS *tokъ* m. ‘current, course’; Ru. *tok* m. ‘current, course’; Pol. *tok* n. ‘current, course’; SCr. *tōk* m. ‘current, course’

The words are listed as an Indo-Slavic isogloss by Arntz (1933: 46). See also LEW: 1051–52 and Derksen (2015: 457). However, the short **ā* in Iranian cannot reflect **o*, as it would have been lengthened by Brugmann’s Law. YAv. *taka-* is rather related to RuCS *tekъ* m. ‘course’ etc. (Derksen 2008: 490), which cannot be separated from OIr. *intech* n. ‘road’.

3.5.78. **top-eie/o-* ‘to make hot’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
No (Germanic)	Compelling	Possible	^V Derivation

Indo-Aryan: Skt. *tāpáyati* ‘to heat up, torture’ (AV+)

Iranian: YAv. *tāpaiieiti* ‘to make hot’

Baltic: –

Slavic: Ru. *topít’*, *topljú* ‘to stoke, heat, melt’; Pol. *topić*, *topię* ‘to melt, fuse’; SCr. *tòpiti*, *tòpīm* ‘to melt’

According to Arntz (1933: 56), Indo-Iranian (EWAia I: 623–24; Cheung 2007: 378–80) and Slavic (Derksen 2008: 496) share a causative stem not found in other branches (cf. LIV: 630). However, ON *þefja* ‘to cook thick’, though only attested as a past participle,¹⁸⁷ seems to reflect a similar formation. Therefore, **top-eie/o-* is not exclusively Indo-Slavic.

¹⁸⁷ Cf. *hann hafði þá eigi þafðan sinn graut* ‘he had not cooked his porridge thick’.

3.5.79. **tous-eie/o-* ‘to make calm, silent’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Doubtful	Rejected	^V Derivation

Indo-Aryan: Skt. *toṣáyati* ‘to appease, satisfy’ (Sū.+)

Iranian: –

Baltic: Lith. *tausýtis, taĩsos* ‘to become calm (of wind)’

Slavic: Ru. *tušít’*, *tušú* ‘to quench, extinguish’; Pol. *potuszyć, potuszę* ‘to comfort’; Sln. *potúšiti* ‘to quench, extinguish’

Arntz (1933: 46) listed this causative stem as an Indo-Slavic isogloss. While the forms are surely derived from the same Indo-European root **teus-* ‘to be calm’ (EWAia I: 672; Vasmer III: 158; Smoczyński 2018: 1457), it cannot be excluded that they reflect independent derivatives. The late attestation of Skt. *toṣáyati* ‘to appease, satisfy’ suggests that this is indeed the case.

3.5.80. **tr-ne-d-* ‘to pierce, split’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Rejected	^V Derivation

Indo-Aryan: Skt. *ṭṛṇátti* ‘to pierce, split, open’

Iranian: –

Baltic: Lith. *trendėti, -ėja* ‘to be eaten up by moths or worms’

Slavic: –

According to the etymology supported by Fraenkel (LEW: 1117) and Mayrhofer (EWAia I: 634), Lith. *trendėti* ‘to be eaten up by moths or worms’ reflects a neo-root **trend-* that was extracted from a nasal present stem corresponding to Skt. *ṭṛṇátti* ‘to pierce, split, open’. This was listed as an Indo-Slavic isogloss by Arntz (1933: 46). However, as argued by Smoczyński (2018: 1511), Lith. *trendėti* cannot be separated from *trenėti* ‘to rot, decay (of wood); to become tattered (of clothes)’, from which it is likely derived. This development may have been shared with Slavic in view of OCS *trǫdbъ* m. ‘tree fungus; illness’ etc. (Derksen 2015: 469). Accordingly, the connection to Skt. *ṭṛṇátti* should be rejected.

3.5.81. **uer-* ‘to choose, put faith in’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	Root

Indo-Aryan: Skt. *varⁱ⁻* ‘to choose’

Iranian: OAv., YAv. *var-* ‘to choose’, *fraorənta* ‘he professed his faith’

Baltic: –

Slavic: OCS *věra* f. ‘faith, belief’; SCr. *vjěra* f. ‘id.’

Meillet (1926: 170–71) argued that Skt. *varⁱ-* etc. is related to OCS *věra* ‘faith, belief’, citing the Avestan form *fraorənta* ‘he professed his faith’ as a semantic link between the two. However, I see no reason to prefer this etymology over the traditional view that OCS *věra* is related to OIr. *fír* ‘true’, Lat. *vērus* ‘true’, OHG *wāra* f. ‘treaty, loyalty, protection’, etc. (cf. Derksen 2008: 520).

3.5.82. **ure/o-to/eh₂-* ‘vow’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Possible	^N Derivation

Indo-Aryan: Skt. *vratá-* n. ‘vow, religious observance, commandment’

Iranian: OAv. *uruuata-* n. ‘rule, order, indication’; Oss. I *iræd* / D *ærwæd* ‘bride price’

Baltic: Lith. *ratà* f. ‘formula, oath, vow’

Slavic: ORu. *rota* f. ‘oath’; Pol. *rota* f. ‘oath’; SCr. *rota* f. ‘oath’

Arntz (1933: 54) listed the above words as an Indo-Slavic isogloss. In older literature, the etymology has often been accepted (LEW: 702; Vasmer II: 539), but it is not mentioned by Mayrhofer (EWAia II: 595). Indeed, despite the semantic similarity, the Indo-Iranian and Balto-Slavic words can hardly be equated. Indo-Iranian **urata-* presupposes Pre-PIIr. **ureto-*, which excludes the often-assumed relatedness to Gr. *ρήτρα* f. ‘verdict, agreement’, *ρήτορς* ‘appointed’ < **uerh₁-* ‘to say’. The deeper etymology of PIIr. **urata-* is unknown. The Balto-Slavic forms, on the other hand, of which Lith. *ratà* ‘formula, oath, vow’ is apparently a Slavic borrowing (LEW: 702), have *o*-grade in the root. It is perhaps more plausible to take ORu. *rota* ‘oath’ etc. as borrowings from Iranian (as suggested by Schlerath 2001: 289).

3.5.83. **urH-uo/eh₂-* ‘enclosure; hole, burrow’

Indo-Slavic exclusivity	Etymology	Shared innovation	Typology
Yes	Rejected	Rejected	^N Derivation

Indo-Aryan: Skt. *ūrvá-* m. ‘container, enclosure, dungeon’

Iranian: –

Baltic: Lith. *ūrvas*, *uĩvas* m., *ūrva*, *urvà* f. ‘hole, burrow, cave’; Latv. *urva* f. ‘hole in the ground, pit’

Slavic: –

Arntz (1933: 52) listed the above words as an Indo-Slavic isogloss. However, the forms can hardly be reconciled formally, as unaccented **-rHu-* would regularly give Skt. *-urv-* in prevocalic position, cf. *urvārā-* f. ‘arable land, field yielding crop’ < **h₂rh₃-uer-eh₂-*. Lubotsky (1997) argues that the long *ū* is secondary from Skt. *ūrṇóti* ‘to cover’, deriving *ūrvá-* from **uel-* ‘to cover’, which would imply that a connection to the Baltic words (with *-r-*) is excluded (similarly EWAia I: 245). The Baltic vocalism also looks irregular, cf. Lith. *vĩlna* f. ‘wool’ < **Hulh₁-neh₂-*. Following Smoczyński (2018: 1571), the semantic

difference between Skt. *ūrvā-*, whose basic meaning seems to be ‘enclosure’, and the Baltic word, which seems to derive from an adjective meaning ‘hollowed out’, is a further counterargument against the etymology.

4. Analysis of the Indo-Slavic isogloss corpus

4.1. Introduction

Fifty-five (55) isoglosses fulfil the required criteria and may be regarded as the corpus of Indo-Slavic lexical isoglosses. In this chapter, the compelling isoglosses are categorized and analysed based on their type, semantics, and languages of attestation. The aim is to assess the value of the isoglosses for research question A: “Do the lexical isoglosses shared by Indo-Iranian and Balto-Slavic support an Indo-Slavic subgroup within Core Indo-European?”. Additionally, non-exclusive isoglosses classified as rejected and uncertain are summarized.

4.2. Attestation across Indo-Aryan, Iranian, Baltic, Slavic

The Indo-Slavic isoglosses are distributed across the Indo-Aryan, Iranian, Baltic, and Slavic subbranches as shown in Figure 11.

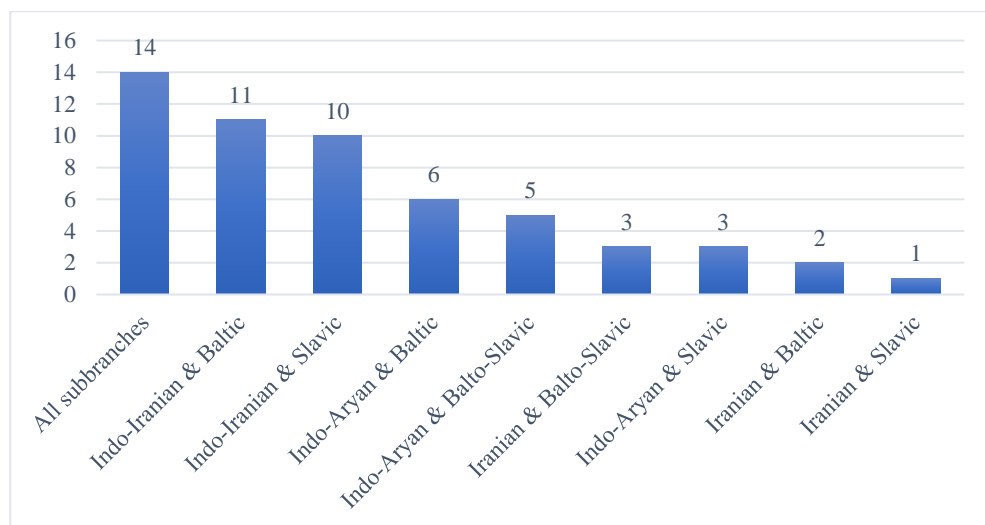


Figure 11. Isogloss distribution across (sub)branches.

Figure 11 shows that a majority of the isoglosses are attested in three or four subbranches. Indo-Aryan shares fourteen (14) isoglosses with Baltic, Slavic, or both Balto-Slavic subbranches vs. Iranian's six, which may be attributed to the poorer attestation of Old Iranian. Otherwise, no single subbranch stands out markedly in sharing more isoglosses with the other branch, e.g., Baltic shares roughly the same number of isoglosses with Indo-Iranian as Slavic does.

Thus, the data suggests that partially attested isoglosses (e.g., Iranian-Baltic) should not be treated differently from those attested in all subbranches (Indo-Aryan, Iranian, Baltic, and Slavic). Of course, wider attestation in the subbranches may ensure the antiquity of the formation in question, but that is a separate issue. Since Indo-Iranian and Balto-Slavic, respectively, are defined by a large number of shared innovations (cf. Kümmel 2022; Pronk 2022), there is no compelling reason to assume that, e.g., an Indo-Iranian-Baltic isogloss resulted from a shared innovation to the exclusion of Slavic. Rather, the most economic assumption is that partial attestation within the branches is due to lexical replacement and loss. Therefore, as a general principle, I weigh isoglosses attested in only one subbranch of each branch equally as those attested in both. It may be noted that a larger number of isoglosses is attested in both Indo-Iranian subbranches but only in one Balto-Slavic subbranch than *vice versa*. This may possibly be attributed to the relatively late attestation of Balto-Slavic, increasing the chance of lexical replacement and loss.

Nevertheless, the isoglosses uniquely shared by Slavic and Indo-Iranian require a separate discussion, since Slavic is known to have been in contact with Iranian languages previously spoken in eastern Europe (Abaev 1965; Matasović 2008: 47; Sakhno 2018).

Of the 10 Indo-Iranian-Slavic isoglosses, **h₂eg-ino-* 'animal skin, leather' and **ǵ^heuH-e/o-* 'to call, curse' show acute accentuation in Slavic due to the effect of Winter's Law or a laryngeal, respectively, and can therefore hardly be Iranian borrowings. The same goes for **h₃ieb^h-e/o-* 'to copulate', where the *e*-vowel of the Slavic reflexes cannot reflect

Iranian *a* < **e*. Similarly, **kuoit-ó-* ‘white, bright’ shows depalatalization of **k* in Slavic, which must be a (Pre-)Proto-Balto-Slavic development. The velar-sibilant clusters of **kseud-* ‘to make small; to spray’ and **peh₂gs-ó-* ‘(body part) having a side’ have different developments in Slavic and Iranian. The Slavic reflex of **g^woih₃-o-* ‘life’ is semantically different from its Iranian cognate, which means that a borrowing is unlikely. Finally, the Slavic reflexes of **g^(wh)eld^h-* ‘to be greedy, desire’ and **uolk-o-* ‘hair’ have *l* contra Iranian *r*. For **g^houH-o-* ‘call, invocation’, no specific arguments against a borrowing from Iranian can be found.

As for the Iranian-Slavic semantic isogloss **k^leu-os-* ‘word; fame’, Slavic **slövo* ‘word’ can hardly be borrowed from Iranian **sra^uah-*, on account of the *l*. However, it has been argued that the inherited Slavic **slövo*, which originally only meant ‘fame’, was influenced semantically by Iranian **sra^uah-* through language contact (Benveniste 1967). This is possible, but not verifiable, and in any case not more plausible than assuming that the shared semantics are inherited.

Lastly, three isoglosses are only attested in Indo-Aryan and Slavic. The Slavic reflex of **h₁uk-ie/o-* ‘to be accustomed to’ has undergone Balto-Slavic laryngeal metathesis and can hardly be a borrowing. In the case of **uert-men-* ‘course’, the *e*-grade in the root in Slavic precludes a borrowing scenario. For **b^hrod^h-no-* ‘a (pale) horse colour’, there are no phonological arguments against borrowing, but the fact that the word is not attested in Iranian makes such an assumption problematic.

In sum, the isoglosses shared by Slavic and Indo-Iranian are best explained as cognates and should not be explained away as borrowings.

4.3. Typological classification of isoglosses

As described in 3.1, the isoglosses were classified according to type. A summary of the typological classification of the lexical isoglosses is presented in Figure 12. Note that one and the same isogloss may belong to more than one category (e.g., “root” and “nominal derivation”), which is why the total number here exceeds fifty-five (55). In what follows, each category is treated separately.

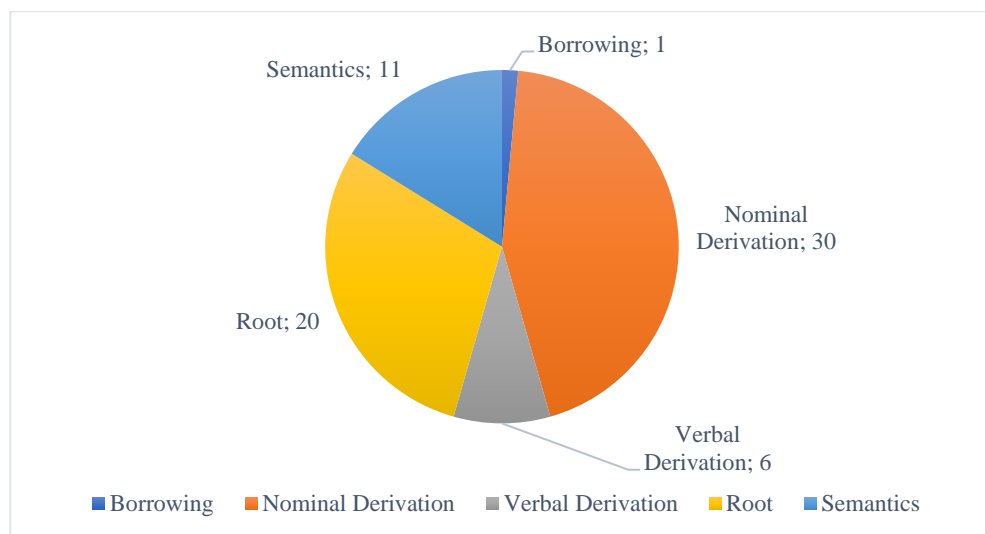


Figure 12. Typology of Indo-Slavic lexical isoglosses.

4.3.1. Shared borrowings

Not to be confused with borrowings from, e.g., Iranian to Slavic, shared borrowings (from unknown sources) go back to the Pre-Proto-Balto-Slavic and Pre-Proto-Indo-Iranian periods. These may also be termed shared substrate words. The only case identified as a shared borrowing from an unknown source among the lexical isoglosses is **h₂eǵ-* ‘goat’. The scarcity of identifiable shared borrowings is not surprising, since the methodological criteria are quite strict (cf. 2.2.3); it is not enough that a word is limited to Indo-Slavic and lacks an Indo-European etymology, there should also be irregular correspondences with other languages, as in the case of **h₂eǵ-* vs. **h₂eiǵ-*. It cannot be excluded that other isoglosses which lack a compelling Indo-European etymology are loanwords (e.g., **d^hoH-neh₂-* ‘grains’, **uolo-* ‘tail hair (of horse)’), but these cannot be corroborated by irregular correspondences in other branches.

As discussed in 3.2.2, it is unlikely that **h₂eǵ-* is an archaism that was replaced by **h₂eiǵ-* in Greek, Armenian, and Albanian, since the latter is also attested in the isolated Iranian **jja-* ‘leather’. At the same time, on account of the shared derivative **h₂eǵ-ino-* ‘animal skin, leather’, it seems unlikely that **h₂eǵ-* was borrowed independently by Indo-Iranian and Balto-Slavic. As such, **h₂eǵ-* constitutes an important piece of evidence in favour of a period of Indo-Slavic linguistic unity.

As for the origin of **h₂eǵ-* ‘goat’, we may only speculate. Given the formal closeness to **h₂eiǵ-*, it is possible that **h₂eǵ-* was mediated through an unattested Indo-European language. However, a non-Indo-European source is also possible.

4.3.2. Nominal derivation

Thirty (30) isoglosses involving nominal derivation were found, including cases of derivation through suffixation, ablaut, and compounding. Below, a distinction is made

between nominal derivatives whose roots are attested elsewhere in Indo-European and those for which the root also constitutes an Indo-Slavic isogloss.

4.3.2.1. Derivatives of roots attested in other Indo-European branches

4.3.2.1.1. Adjectives

The roots of **kieh₁-mo-* ‘black, dark, grey’ and **k^huen-to-* ‘holy, sacred’ do not occur in verbal formations. The stems could still be innovations, since the corresponding verbal stems may have been lost at a later date. However, it cannot be ruled out that they are archaisms.

The stem **h₂eg^h-ino-* ‘animal skin, leather’ is a noun, but clearly based on an adjective in **-ino-*. Since 1) the root **h₂eg^h-* ‘goat’ is unlikely to be an archaism, 2) **-ino-* is not productive in Indo-Iranian, and 3) both Indo-Iranian and Slavic show the same substantivization of the original adjective, **h₂eg^h-ino-* is a plausible shared innovation.

4.3.2.1.2. Adverbs and preverbs

The adverb **h₂eu-r-eh₁* ‘(over) there, downwards’ is not entirely clear from a derivational perspective, but may derive from an old locative **h₂eu-r* + adverbial suffix **-eh₁* (which may be identical to the instrumental ending). The formation may well be a shared innovation, but an archaism is difficult to exclude.

Indo-Slavic **som* ‘together, with’ is a shared derivative of PIE **sem-* ‘one’ and is also used in a syntactically equivalent way in the branches, i.e., as a preverb in Indo-Iranian and preposition in Balto-Slavic, deriving historically from a preverb. As discussed in 3.2.5, **som* is a compelling shared innovation *vis-à-vis* **kom*, attested in all branches except Albanian, Armenian, and Tocharian.

4.3.2.1.3. Athematic nouns

Seven isoglosses are athematic stems. Indo-Slavic **mosg^h-en-* ‘brain, marrow’ is probably denominal from **mosg^h-o-* and could be a shared innovation, although the derivational pattern was already productive in Core Proto-Indo-European. As for **d^heh₁i-nu-* ‘female mammal’, **mentH-eh₁-* ‘(wooden) tool for stirring’, **peh₃i-men-* ‘milk’, **uert-men-* ‘course’, and **suleh₂-* ‘juice; milk’, they may be understood as deverbal derivatives of roots that are all attested in Balto-Slavic and/or Indo-Iranian, although in the case of **suleh₂-* ‘juice; milk’ it is not clear whether the base is **seu-* ‘to press’ or **suel-* ‘to consume’. In all cases, shared innovations are possible. However, since the suffixes are found elsewhere in Indo-European, archaisms are difficult to exclude.

Conversely, **h₁ong^(w)-l-* ‘coal’ does not have an attested verbal base, but is probably formed from the same root as PIE **h₁ng^(w)-ni-* ‘fire’. It may therefore be taken as an archaism, but it cannot in principle be excluded that the verbal root was lost after the derivation of **h₁ong^(w)-l-* in Indo-Slavic.

4.3.2.1.4. Barytone thematic stems with *o*-grade in the root

There are two nomina actionis among the isoglosses, **ǵ^houH-o-* ‘call, invocation’ and **g^woih₃-o-* ‘life’, from **ǵ^heuH-* ‘to call’ and **g^weh₃i-* ‘to live’, respectively. This category of deverbal nouns, characterized by *o*-grade in the root, is also common in, e.g., Greek and Germanic (Brugmann 1892: 104). It remained productive in Indo-Iranian and Balto-Slavic, implying that **ǵ^houH-o-* and **g^woih₃-o-* may or may not be shared innovations.

The isogloss **uolk₂-o-* ‘hair’ has a similar structure, but cannot be connected to any known verbal root. Based on the comparison with Gr. *λάχνη* f. ‘woolly hair, down’ < **ul_k-sneh₂-*, a verbal root **uel_k-* ‘to stick out, sprout (?)’ may be reconstructed. It may be argued that the derivatives must be archaisms, since the verb was lost in the branches. However, it cannot be excluded that the loss happened independently in Greek on the one hand and Indo-Slavic on the other, and that the derivatives are independent.

The adjective **nog^w-o-* ‘naked’ is probably not deverbal at all, but may rather be a dissimilation or taboo deformation of an earlier **nog^w-no-*, and is as such a possible shared innovation.

Finally, **ǵ^hos-to-* ‘hand’ is clearly connected to a root **ǵ^hes-* as reflected in Proto-Indo-Anatolian **ǵ^hes-r-* ‘hand’, as well as other nominal formations (e.g., Skt. *sahásra-* n. ‘thousand’, Lat. *mille* ‘thousand’). However, corresponding verbal forms are not attested. Furthermore, the structure of **ǵ^hos-to-* ‘hand’ is unclear. If **ǵ^hos-to-* is a deverbal *to*-stem from an unattested **ǵ^hes-* ‘to grasp, grab’, it is unclear why it should mean ‘hand’, cf. Gr. *χόρτος* m. ‘enclosure, court’ < **ǵ^hor-to-* << **ǵ^her-* ‘to seize’. In any case, it is highly conspicuous that **ǵ^hos-to-* ‘hand’ is attested in precisely those branches that do not continue the archaic stem **ǵ^hes-r-* ‘hand’. This suggests that a lexical replacement took place in Indo-Slavic. In this sense, it is not so much the derivative itself but its relationship with the other Indo-European word for ‘hand’ that may be understood as a plausible shared innovation.

4.3.2.1.5. Compounds

Shared Indo-Slavic compounds include **h₁su-dru-* ‘made of good wood’ and **ni-h₃(e)k^w-* ‘facing downwards’. Given the many parallels formed from other preverbs, the productivity of compounds with **h₃(e)k^w-* ‘eye’ may be reconstructed to Core Proto-Indo-European. However, they remained productive in some branches, evidenced by, e.g., Skt. *pratyāñc-* ‘facing’ vs. YAv. *paitiiañc-* ‘turned against’, where Iranian has replaced **prati* by **pati*.

As for **h₁su-dru-* ‘made of good wood’, parallel formations may also be cited, e.g., Skt. *sudív-* ‘bringing the good day’, Gr. *εὐδία* f. ‘beautiful, bright weather, calm (of wind), quiet (of the sea)’. However, such compounds of course continued to be productive in Indo-Iranian.

On balance, it does not seem unlikely that **h₁su-dru-* and **ni-h₃(e)k^w-* are shared innovations, but archaisms cannot be excluded.

4.3.2.1.6. Oxytone *o*-stems

Two isoglosses are oxytone *o*-stems, although of different types. As argued in Chapter 3, **peh₂gs-ó-* ‘(body part) having a side’ is likely derived from **peh₂gos-* ‘side’ and constitutes a possible shared innovation, although it cannot be excluded that the stem was lost in other branches.

As for **k^huoit-ó-* ‘white, bright’, it may be analysed as originating from a nomen agentis of **k^hueit-* ‘to shine’, or alternatively from a possessive adjective (i.e., ‘having brightness’) of an unattested nomen actionis **k^huoit-o-* ‘brightness’. Since the stem looks ultimately deverbal, and verbal stems from this root are exclusive to Indo-Iranian and Balto-Slavic, **k^huoit-ó-* is a possible Indo-Slavic innovation.

4.3.2.1.7. *ro*-adjectives

Two adjectives in **-ro-* are shared by Indo-Iranian and Balto-Slavic: **b^hud^h-ro-* ‘awake, waking’ and **mik-ro-* ‘mixed’. Adjectives in **-ro-* are famously part of the Caland system and their productivity goes back to Proto-Indo-European.¹⁸⁸ While neither **b^heud^h-* ‘to become awake, attentive’ nor **meik-* ‘to mix’ have tended to feature in treatments of the Caland system (e.g., Nussbaum 1976), **b^hud^h-ro-* ‘awake, waking’ fits into the pattern in the sense that it also has an *s*-stem reflected by YAv. *baodah-* n. ‘observation, recognition, perception’.^{189,190} Based on this, it may be argued that **b^hud^h-ro-* ‘awake, waking’ must reflect a shared archaism.

For **meik-* ‘to mix’, a Caland-like derivational structure is not evident. As discussed in Chapter 3, the palatal **k* of **mik-ro-* has probably been restored, which could point to a shared innovation after satemization, but this chronology is difficult to prove.

It may be concluded that *ro*-adjectives do not offer the most convincing evidence for an Indo-Slavic subgroup.

4.3.2.2. Derivatives of roots exclusive to Indo-Slavic

Seven nominal derivatives contain roots that are not attested elsewhere in Indo-European. In some cases, a root connection outside of Indo-Iranian-Balto-Slavic is formally possible but semantically unconvincing.

4.3.2.2.1. Nouns

The *o*-stems **kop-o-* ‘straw (carried by water)’ and **uolo-* ‘tail hair (of horse)’ are formally comparable to the barytone *o*-stems discussed above (cf. 4.3.2.1.4). Within Lithuanian, *šāpas* < **kop-o-* is connected to *šēpti* ‘to grow in an untidy manner (of hair)’. As for **uolo-*, it could be connected to **uel-* ‘to twist, wind’, but this is not particularly compelling. Similarly, **d^hoH-neh₂-* ‘grains’ has been connected to, e.g., **d^heh₁-* ‘to put’, but a compelling root etymology remains to be found. These stems may reflect derivatives of

¹⁸⁸ For Anatolian, cf. Hitt. *pangarit* adv. ‘in large numbers’, possibly from an unattested **pangara-* < **d^hb^hng^h-ro-*, a Caland-variant of **d^hb^hng^h-u-*, reflected in Skt. *bahú-* ‘many, much’.

¹⁸⁹ The *i*-stem of Skt. *bodhi-* f. ‘perfect wisdom’ and YAv. *baodi-* f. ‘smell, fragrance’ is probably not old.

¹⁹⁰ According to Bozzone (2016), Caland roots formed root aorists with contrastive Class I presents in Vedic, which is also true for Skt. *bodh-* (EWAia II: 234).

roots that were subsequently lost, in which case it could be argued that they are archaisms. However, it is equally possible that the roots were lost at a later stage (i.e., post-Indo-Slavic) or that the words in fact are borrowings from non-Indo-European languages.

The structure of **HoustHo-* ‘lip’ is not well understood. It may be argued that its non-transparent structure points to an archaic formation, perhaps an old compound. Alternatively, if the aspirate in Skt. *ósṭha-* m. ‘(upper) lip’ is secondary, it may have been derived from a root **Heus-* (+ *-to-*) that was subsequently lost, in which case the same considerations apply as for the stems above.

4.3.2.2.2. Adjectives

The two adjectives **b^hrod^h-no-* ‘a (pale) horse colour’ and **krs-no-* ‘black’ share the same suffix and semantic field. This could be taken to indicate that colour adjectives in **-no-* were productive in Indo-Slavic. However, the fact that the roots are not (securely) attested elsewhere may serve as an argument for analysing them as archaic formations, assuming that the roots were lost in Proto-Indo-European already.

The structure of **tusk-io-* ‘empty’ is disputed, but it may be connected to YAv. *tusən* ‘they lose (temper)’. Since verbal stems from this root are not attested elsewhere, it is not unlikely that **tusk-io-* is a shared innovation in this scenario.

4.3.2.3. Indo-Slavic derivational morphology?

All nominal derivatives (for which the derivational structure is transparent) are formed using morphology that is known from other branches of Indo-European. In other words, no uniquely Indo-Slavic suffixes or other derivational strategies are discernible from the data.

4.3.3. Verbal derivation

Six verbal stems are found among the isoglosses, all thematic presents of various types.

The full grade thematic present **ǵ^heuH-e/o-* ‘to call’ contrasts with a root present continued in ToB *kwātār*. However, since Sanskrit has a root aorist (3sg.med. *āhvāt* with secondary *-t*), the Tocharian root present may be secondary, and it is difficult to exclude that **ǵ^heuH-e/o-* ‘to call’ is archaic. Similarly, **h₃ieb^h-e/o-* ‘to copulate’ contrasts with Gr. οἶϕω ‘to copulate’ < **h₃e-h₃ib^h-e/o-*, which could be analysed as a more archaic formation or as an iterative to the simple thematic stem. ToB *yäp-* ‘to enter’ with the present *yänmä^ʰskē/ššä-* not only reflects a different formation but also different semantics and thus looks more archaic than either the Indo-Slavic or Greek formations. Finally, with **ǵuelH-e/o-* ‘to burn, shine’, the situation is more uncertain, as no other branches attest verbal stems from this root. In all three cases, it is difficult to exclude independent innovations, since thematicization is productive, especially in Balto-Slavic.

Several *eie/o-* presents were rejected or classified as uncertain, due to indications that they are secondary, productive formations within the branches. A special case is **d^hor-eie/o-* ‘to hold, support’. Since this does not look like a productive formation in either Indo-Iranian or Baltic, it is hardly an independent innovation, although this also means that it may be taken as an archaism.

The stem **h₁uk-ie/o-* ‘to be(come) accustomed to’ is a compelling isogloss, but an archaism cannot be excluded.

The stem **tsprh_{2/3}-e/o-* ‘to kick away with the foot’ contrasts with a nasal stem **tspr-ne-h_{2/3}-* attested in Armenian, Latin and Germanic. In this sense, it may be an innovation. It is especially interesting that Sanskrit and Slavic share traces of a root aorist from the same root, cf. Skt. 2sg.aor.inj. *spharīs* (Narten 1964: 282). The same pattern of an Indo-Slavic *tudāti*-present next to a root aorist is found in **g^{wr}h₃-e/o-* ‘to devour, swallow’, although the latter was classified as uncertain. Yet, these two cases may preserve a trace of a productive pattern of forming *tudāti*-presents to root aorists, which could be Indo-Slavic, although it is difficult to exclude that it is a more archaic derivational pattern.

4.3.4. Roots

Twenty (20) roots exclusive to Indo-Iranian and Balto-Slavic were identified. Since eight of these have already been treated in 4.3.1 and 4.3.2 above, this section will focus on the pure root isoglosses, where no shared nominal or verbal derivatives are attested. Generally, roots tend not to be innovated. However, some of the Indo-Slavic root isoglosses may contain innovative elements.

The root **neih₁-* ‘to churn’ likely derives from **(s)neh₁(i)-* ‘to turn, twist’, where the **-i-* was incorporated from an *i*-present. The process, although rather trivial, could be a shared innovation, especially since it is accompanied by a plausible semantic innovation in the root, cf. 4.3.5 below. Similarly, **g^(w)eHi-* ‘to sing’ derives from **g^(w)eH-*, but since the *i*-form in this case has not completely ousted **g^(w)eH-*, which still appears in Indo-Iranian, it is difficult to exclude an independent innovation.

It is attractive to analyse **g^(w)eh₂ǵ^h-* ‘to wade’ as **g^weh₂-* ‘to go’ + **-ǵ^h-*, especially in view of the semantically identical and formally close root **g^weh₂d^h-* ‘to wade’. The same root extension seems to be found in **b^heǵ^h-* ‘outside, without’ and could possibly be identical to the particle **-ǵ^hi* (cf. Dunkel 2014: 272–73). The root **g^(w)eld^h-* ‘to be greedy, desire’ is possibly an extended version of **g^wel(h₃)-* or **h₁g^whel-* ‘to wish, want’, but the exact reconstruction is uncertain.

The root **ǵelp-* ‘to murmur, babble’ is likely onomatopoeic. This could be a shared innovation, although an archaism or independent innovation cannot be excluded.

For the remaining root isoglosses, **d^hemH-* / **d^hmeH-* ‘to blow’, **ǵ^huel-* ‘to be bent, walk crookedly’, **kéuH-* ‘to throw, shove, shoot’, **kseud-* ‘to make small; to spray’, **seng-* ‘to attach, fasten’, and **seuk-* ‘to turn, twist; to churn’, there is no indication that the roots themselves are innovations, or that they contain root extensions.

4.3.5. Semantics

The eleven (11) semantic isoglosses may be divided into two types: 1) roots or formations that are found in other branches but have a different meaning in Indo-Slavic, 2) roots or formations that are not found elsewhere but that for various reasons seem to have undergone a shared semantic shift in Indo-Slavic.

Of the five isoglosses that belong to the first type, **kleu-os-* ‘word; fame’ and **pelH-ou-* ‘chaff’ are possible innovations, although it cannot be excluded that the shared semantics are archaic.

On the other hand, **k^wer-* ‘to perform magic’ reflects a semantic specification of **k^wer-* ‘to do, make’ that can hardly have happened in the other direction. Similarly, **ne* ‘as, like’ derives from **ne* ‘not’, not the other way around. Also **k(o)rt-* ‘(one) time(s)’, whether it is derived from **(s)kert-* ‘to cut’ or **kert-* ‘to spin’, is a semantic innovation. In these cases, independent innovation in Indo-Iranian and Balto-Slavic remains possible, but shared Indo-Slavic innovation is not unlikely.

The six semantic isoglosses of the second type include **d^heh₁i-nu-* ‘female mammal’ and **h₂eg⁻ino-* ‘animal skin, leather’, the former having undergone semantic narrowing from ‘suckling (one)’ and the latter semantic broadening from ‘goat skin, goat product’, which would have been the expected primary meanings of the derivatives. In both cases, independent innovations are unlikely, given the non-productive shared morphology. In the case of **d^heh₁i-nu-* ‘female mammal’, it cannot be excluded that the meaning is archaic along with the stem itself, but for **h₂eg⁻ino-* this is implausible, since the root and derivative are plausible innovations in their own right.

The root **neih₁-* ‘to churn’ has undergone a semantic shift from **(s)neh₁(i)-* ‘to turn, twist’. The same root gave rise to Indo-Iranian **naiH-* ‘to lead’ and Balto-Slavic **niH-ti-* ‘thread’. As argued in Chapter 3, **neih₁-* ‘to churn’ is unlikely to be an archaism, since the root it derives from, **(s)neh₁(i)-* ‘to turn, twist’, is still attested in the other branches. On the other hand, it looks archaic within Indo-Iranian and Balto-Slavic, as it cannot be derived from the other reflexes of **(s)neh₁(i)-* in the respective branches. Therefore, **neih₁-* is a plausible shared Indo-Slavic innovation.

Similarly, **seuk-* ‘to churn’ has undergone a semantic shift from ‘to turn, twist’. In Iranian, **seuk-* ‘to churn’ is limited to a single derivative and must be regarded as archaic within Indo-Iranian. However, while a shared innovation is possible, the fact that Balto-Slavic also preserves the basic meaning of the verb, i.e., ‘to turn, twist’, makes it difficult to exclude that the semantic development is independent in Baltic.

The basic meaning of **g^huel-* may be reconstructed as ‘to be bent, walk crookedly’, but both Indo-Iranian and Balto-Slavic have derivatives that mean ‘wrongful, evil, rude’ vel sim. While this may reflect a shared innovation, it cannot be excluded that the root itself and its semantics are archaic and were lost in the other branches.

The compound **som-d^heh₁-* acquired the meaning ‘agreement’ << ‘putting together’ in Indo-Iranian and Balto-Slavic, possibly in a compounded root noun reflected by Skt. *saṃdhā-*, although an exact formal parallel in Balto-Slavic is lacking. This can hardly be an archaism, since the preverb **som* is also an Indo-Slavic isogloss. However, independent innovation is difficult to exclude, especially given the semantic parallel found in Gr. σύνθεσις f. ‘putting together; agreement’.

4.4. Semantic clusters in the isogloss corpus

This section explores groups of isoglosses that can be clustered based on semantics. The aim is to provide a basis for studying the hypothesized Indo-Slavic subgroup from a linguistic palaeontological perspective, as per research question A3 (cf. 1.4). As described in 2.5, inferences on cultural developments based on linguistic palaeontology rely on successful phylogenetic stratification of reconstructed words. This implies that shared lexical innovations may be hypothesized to correlate with cultural innovations, whereas independent innovations and shared archaisms may not. However, shared archaisms are not irrelevant, as they may attest to continuous familiarity with a particular concept.

Not all semantic clusters discussed below are relevant for linguistic palaeontology (e.g., body parts in 4.4.4), but are listed anyway, as they attest to lexical similarity of Indo-Iranian and Balto-Slavic in certain semantic fields.

4.4.1. Agriculture

The attested Balto-Slavic and Indo-Iranian reflexes of **d^hoH-neh₂-* ‘grains’ and **pelH-ou-* ‘chaff’ are terms referring to processed cereals. In the Rigveda, *dhānā-* refers rather generally to roasted¹⁹¹ grains (e.g., RV III.52), but the following attestation more clearly suggests an agricultural connotation:

RV X.94.13cd

vāpanto bījam iva dhānyākṛtaḥ prīcānti sōmam nā minanti bāpsataḥ

‘Like grain-producers [=farmers/millstones] strewing seed, strewing their “seed” [=semen] they engorge the soma. They do not diminish him though they gnaw at him’ (Jamison & Brereton 2014: 1547).

Lith. *dūona* f. has a clearly agricultural meaning, referring to ‘bread’, but also ‘bread grains, rye’. This correspondence implies that **d^hoH-neh₂-* should be reconstructed with agricultural semantics, although it is difficult to exclude the possibility that the term originally referred to processed wild seeds. Similarly, the attested forms of **pelH-ou-* ‘chaff’ agree in meaning, but it is difficult to entirely rule out that it could have originally referred to chaff from wild cereals, such as *Stipa*, also known as feather grass (Rühl, Herbig & Stobbe 2015).

The question of Indo-European agricultural terminology reaches far beyond **d^hoH-neh₂-* ‘grains’ and **pelH-ou-* ‘chaff’, however. In the case of Balto-Slavic, it is commonly recognized that the branch shares a set of agricultural terms with other European branches (cf. Kroonen et al. 2022). Conversely, it has been argued that Indo-Iranian split off from the Indo-European community before the European branches innovated their agricultural vocabulary (Schrader 1883). On the other hand, Hirt (1892; 1895b) argued that Proto-Indo-European society had agriculture, but that most agricultural vocabulary was lost in Indo-Iranian.

¹⁹¹ The semantic specification is evidenced by RV IV.24.7b *pácāt paktīr utā bhṛjjāti dhānāḥ* ‘he will cook the cooked foods, and will roast the grains’. The meaning ‘roasted grains’ agrees with Shu. *ḍūn* ‘roasted grain’ and Yagh. *don* ‘roasted grain’.

Kroonen et al. (2022) show that Indo-Iranian in fact does share some agricultural terms with the European branches, which are, additionally, shared innovations to the exclusion of Anatolian, viz. **h₂erh₃-* ‘to plough’, **peis-* ‘to grind’, **se-sh₁-io-* ‘a cereal’, **h₂ed-o(s)-* ‘a (parched?) cereal’. This suggests that agriculture did not play an important role in Proto-Indo-Anatolian society, but became increasingly important in Core Proto-Indo-European. Especially striking is the formation reflected by Skt. *urvārā-* f. ‘arable land, field yielding crop’ and Av. *uruuārā-* f.pl. ‘food plant’ < **h₂rh₃-uer-eh₂-*, which presupposes that Indo-Iranian participated in the semantic shift in *h₂erh₃-* ‘to plough’ << ‘to grind, crush’. The retention of these Core Indo-European terms in Indo-Iranian implies that there is no need to assume that the agricultural semantics of Indo-Slavic **d^hoH-neh₂-* ‘grains’ and **pelH-ou-* ‘chaff’ are secondary, since familiarity with agriculture seems to be confirmed by independent evidence. In fact, doing so would be uneconomical, as it presupposes independent semantic shifts in the respective branches. Based on these considerations, the most straightforward scenario is that the agricultural semantics of these words are old.

As discussed in 4.3 above, it cannot be determined whether **d^hoH-neh₂-* ‘grains’ and **pelH-ou-* ‘chaff’ are archaisms or innovations in Indo-Slavic. In any case, it seems improbable that they were formed in Proto-Indo-Anatolian. Together with the other agricultural terms innovated in (and inherited from) Core Proto-Indo-European, they suggest a continuous familiarity with cereal farming between the split of Core Proto-Indo-European up until the attestation of Indo-Iranian and Balto-Slavic, which must be taken into account in archaeolinguistic hypotheses on the dispersal of these branches.

Besides the inherited terms, Shu. *rivand*, Rosh. *ravand* ‘chickpea’, Yazg. *raván* ‘(chick)pea’ (Morgenstierne 1974: 70) < Plr. **H(a)rab^(h)anTa-* may reflect an irregular correspondence of Gr. ἐρέβινθος m. ‘chickpea’, OHG *arawīz* f. ‘pea’, which may be borrowings from an agricultural substrate language (Hehn 1870: 140; Furnée 1979: 22). Since the Iranian forms are limited to Pamir languages, it is uncertain whether they go back to Proto-Indo-Iranian, however. Similarly, Yazg. *wis*, Taj. Wj. *gis* ‘oats’ may reflect Plr. **(H)(a)uić-*, which can be compared to SCr. *ōvas* m. ‘oats’ < PSl. **ovъsъ*, Lith. *aviža* f. ‘oats’, and Lat. *avēna* f. ‘oats’ (Blažek 2005; Kümmel 2017; Kroonen et al. 2022). However, the irregular correspondence between Baltic *ž* and Slavic *s*, as well as the limited distribution in Indo-Iranian, may point to more recent borrowing. Thus, **H(a)rab^(h)anTa-* ‘chickpea’ and **(H)(a)uić-* ‘oats’ represent possible additional agricultural terms shared with European languages, but their reconstruction to Proto-Indo-Iranian, let alone Indo-Slavic, is far from certain.

4.4.2. Dairy

Five terms relating to dairy production are found among the isoglosses: **mentH-eh₁-* ‘(wooden) tool for stirring’, **neih₁-* ‘to churn’, **peh₃i-men-* ‘milk’, **seuk-* ‘to turn, twist; to churn’, and **suleh₂-* ‘juice; milk’. Of these, **neih₁-* ‘to churn’ is a compelling shared innovation. This cluster could indicate technological innovation in dairy production and/or an increased reliance on dairy products.

Consumption of milk products from sheep, goat, cow, and horse is attested in Early to Middle Bronze Age steppe cultures such as Yamnaya, Poltavka, and Sintashta (Wilkin et al. 2021). Dairy production in Yamnaya culture contexts, which in the Steppe hypothesis is the homeland of (Core) Indo-European (cf. 5.2 below), is consistent with dairy terms shared by various Core Indo-European branches, such as **h₂melǵ-* ‘to milk’,¹⁹² **tuH-ro-* ‘curdled milk’,¹⁹³ and **d^he-d^hh₁-* ‘(sour) milk’. Thus, the set of Indo-Slavic dairy terms attests to continued familiarity with dairy products from Core Proto-Indo-European up until the time of attestation of Indo-Iranian and Balto-Slavic. Additionally, the innovation of **neiH₁-* ‘to churn’ possibly reflects continued innovation in dairy production.

4.4.3. Pastoralism

Four terms relating to pastoralism are **d^heh₁i-nu-* ‘female mammal’, **h₂eǵ-* ‘goat’, **h₂eǵ-ino-* ‘animal skin, leather’, and **uolo-* ‘tail hair (of horse)’. Since Proto-Indo-European is believed to have had a mainly pastoralist economy (Schrader 1890; Kroonen et al. 2022), this cluster need not indicate technological innovation but rather a continued reliance on domesticated animals. Judging by its derivation from **d^heh₁i-* ‘to suck(le)’, **d^heh₁i-nu-* highlights the milk-giving function of female animals in the herd, further highlighting the importance of dairy products, as discussed in 4.4.2 above. The tail hair of a horse, i.e., **uolo-* ‘tail hair (of horse)’, may have been used for various purposes, such as fishing lines (cf. Lith. *vālas* m. ‘fishing line; horse hair’).

4.4.4. Body parts

Several Indo-Slavic isoglosses are terms for body parts. Such words are often considered to be basic vocabulary items, which are potentially significant for subgrouping purposes. In this cluster, we may especially note **ǵ^hos-to-* ‘hand’ and **uolk^h-o-* ‘hair’, which denote concepts that are found on the Leipzig-Jakarta list of basic vocabulary (Tadmor, Haspelmath & Taylor 2010). It is unclear if **peh₂gs-ó-* ‘(body part) having a side’ may be considered a basic vocabulary item, since the exact meaning is not clear, and since the base of this derivative (**peh₂ǵ-os-* ‘side’) need not primarily have referred to the body. Conversely, **HoustHo-* ‘lip’ is semantically clear but derivationally obscure. The stem **nog^w-o-* ‘naked’ is not a body part per se, but relates to the body.

Of course, body parts are not technological innovations and there need not be a particular reason why they are innovated or replaced. The stem **mosg^h-en-* ‘brain, marrow’ did not replace the more widespread **mosg^h-o-* ‘brain, marrow’, but may have had a specialized meaning. Similarly, **nog^w-o-* ‘naked’ did not oust **nog^w-no-* but may be a dissimilated variant or taboo deformation. One may only speculate that other isoglosses in this cluster, e.g., **ǵ^hos-to-* ‘hand’, started out as peripheral variants of more basic lexemes, before replacing them.

¹⁹² A root **h₂melǵ-* is reflected in ToB *malḳwer* m. ‘milk’, Gr. ἀμέλγω ‘to milk’, Lat. *mulgeō* ‘to milk’, OIr. *mligid* ‘to milk’, Goth. *miluks* f. ‘milk’, Lith. *mélžti* ‘to milk’, Alb. *mjel* ‘to milk’. However, the root is conspicuously absent from Indo-Iranian.

¹⁹³ A stem **tuH-ro-* ‘curdled milk’ may be reconstructed based on YAv. *tūiri-* n. ‘curdled milk’ and Gr. τυρός m. ‘cheese’.

4.4.5. Colours

Four colour adjectives are found among the isoglosses, viz. **b^hrod^h-no-* ‘a (pale) horse colour’, **k^hieh₁-mo-* ‘black, dark, grey’, **k^huoit-ó-* ‘white, bright’, and **krs-no-* ‘black’.

Of particular interest is **b^hrod^h-no-*, since it is specifically used to describe horses. Domesticated horses have been regarded as a key feature of early Indo-European communities (Anthony 2007; 2023a; 2023b), but horse domestication and horse riding have alternatively been argued to be post-Proto-Indo-European innovations (Hehn 1877: 53; Schrader 1890: 382; Renfrew 1989; Meid 1994). Based on genetic evidence, Librado et al. (2021) show that by 2200 BCE, the modern domesticated horse spreads from the Sintashta horizon, i.e., in post-PIE times. Before this, local breeds were more genetically diverse. Since horse coat colour is a feature of domestication, a word like **b^hrod^h-no-* could have served to designate a local breed. However, it cannot be connected to a specific archaeological context.

4.4.6. Magic and religion

The isoglosses **k^huen-to-* ‘holy, sacred’ and **k^wer-* ‘to perform magic’ belong to a magical or religious semantic cluster. Additionally, at least in Indo-Iranian, the reflexes of **g^(w)eHi-* ‘to sing’ are associated with singing in a ritual context. These terms may reflect novel ritual practices. Unfortunately, such cultural features are difficult to compare to the archaeological record in a meaningful way.

4.5. Non-exclusive isoglosses

Many proposed isoglosses were rejected on formal or semantic grounds, or because they can convincingly be argued to reflect independent formations. Other proposed isoglosses were rejected because a cognate was found in a third branch of Indo-European. Certain branches appear in multiple rejected isoglosses as the third branch next to Indo-Iranian and Balto-Slavic. Such cases, e.g., Indo-Slavic-Albanian isoglosses, could in theory correlate with a higher node in the Indo-European family tree.

Of course, it may well be the case that such non-exclusive isoglosses have previously been analysed as Indo-Slavic isoglosses simply because the etymological lexicography of the third branch was less advanced at the time. For example, already in the 19th century, Latin etymologies were widely available, so that, e.g., Schmidt (1872) or Arntz (1933) would not have proposed an Indo-Slavic isogloss if there was an obvious Latin cognate. Conversely, Tocharian was not known at the time and could not be taken into account. Therefore, it should be noted that the isoglosses listed in the following sections are probably far from exhaustive.

With this in mind, non-exclusive Indo-Slavic isoglosses shared with a third branch are discussed below. Non-exclusive isoglosses that were classified as uncertain are also included, whereas rejected etymologies and rejected shared innovations are left out.

4.5.1. Albanian

Five compelling cases of Indo-Slavic-Albanian isoglosses are found, viz. **dlh₁g^h-ó-* ‘long’, **d^he-d^hh₁-* ‘(sour) milk’, **d^heh₁i-* ‘to contemplate, behold, see’, **g^(w)riH-ueh₂-* ‘neck, nape’, and **h₂eu-* ‘to weave’.¹⁹⁴

In the case of **h₂eu-* ‘to weave’, it is interesting to note that Alb. *vej* ‘to weave’ and Skt. *váyati* ‘to weave’ both seem to reflect **h₂u-eie/o-*, which is a possible shared innovation. The reduplicated stem **d^he-d^hh₁-* ‘milk’ looks archaic, but an innovation cannot be excluded. The adjective **dlh₁g^h-ó-* ‘long’ is a possible innovation, since the branches of Indo-European display several formations from this root with the same meaning, not all of which can be inherited. The root **d^heh₁i-* ‘to contemplate, behold, see’ may reflect a semantic innovation, as it seems to be derived from an *i*-stem of *d^heh₁-* ‘to put’. In the case of **g^(w)riH-ueh₂-* ‘neck, nape’, the deeper etymology is unclear, but it may be an archaism or an innovation based on a lost verbal stem **g^(w)erh₃-i-*.

Finally, **h₁ēd / *h₁ōd* adv. ‘then, and, so’ was classified as uncertain, since it cannot be determined if the Indo-Iranian forms are closer to the possible Albanian or Balto-Slavic cognates, or if they are all related.

Since Albanian is attested so late and preserves relatively few inherited lexemes, it is striking that it shares at least five isoglosses with Indo-Slavic, several of which are possible shared innovations.

4.5.2. Armenian

The root **k^(w)o(n)Hd-* ‘to bite’ was classified as uncertain due to formal problems regarding the comparison between Indo-Iranian and Balto-Slavic, but also due to Arm. *xacanem* ‘to bite, sting’. This could thus be classified as an uncertain Indo-Slavic-Armenian isogloss. However, as a root isogloss, a shared archaism is not unlikely.

4.5.3. Celtic

The sole Indo-Slavic-Celtic isogloss in the corpus is **deks(i)-no-* ‘right’. It is a possible innovation, since the branches of Indo-European attest different formations from an adverb **deks(i)*. However, since Slavic reflects **deks-no-* as opposed to Baltic **deksi-no-*, an independent innovation is difficult to exclude.

4.5.4. Germanic

Indo-Slavic-Germanic lexemes are the most numerous among the non-exclusive isoglosses in the corpus, numbering seven plus four uncertain cases.

The roots **b^heh₂d^h-* ‘to push, press’, **kseub^h-* ‘to sway, swing’, and **k^weit-* ‘to perceive’. The latter has been explained as an extended variant of **k^wei-* ‘to perceive’, but as this root must be reconstructed as **k^weh₁i-*, the etymology is uncertain at best. There is no clear indication that any of the three roots is an innovation, although it is difficult to exclude.

¹⁹⁴ The isoglosses **g^wrH-* ‘rock’ (3.5.24) and **d^heg^wh-e/o-* ‘to burn’ (3.5.16) are not included here, since they have possible cognates in Greek and Tocharian, respectively.

The Indo-Iranian, Baltic, and Germanic words for ‘nave, navel’ can be united under a reconstruction **h₃nob^h-H-*. This formation is a possible shared innovation, since several different formations from this root are attested in the branches of Indo-European. Further, **k_i(e)h₁-uo-* ‘dark, black, grey’ and **krouh₂-io-* ‘corpse; flesh’ are shared derivatives that may be shared innovations.

The *eie/o*-present **top-eie/o-* ‘to make hot’ is shared with Germanic, but independent innovations are difficult to exclude.

Of the isoglosses classified as uncertain, there is nothing against taking **h₂eid^h-smo-* ‘firewood’, **k_eh₁k^(w)-o/eh₂-* ‘green edible plant’, and **(s)ker-men-* ‘hide, skin’ as Indo-Slavic-Germanic isoglosses, but the Germanic forms all have alternative etymologies. In the case of **b^hreh₁ǵ-* ‘to shine, dawn’, the Germanic comparanda are isolated to North Germanic, and the analysis of this root as an archaism or innovation *vis-à-vis* **b^he/orh₁ǵ-* is uncertain.

Although several cases discussed here are not compelling shared innovations, the comparatively high number of Indo-Slavic-Germanic lexical isoglosses is interesting, especially in view of the many lexical isoglosses shared by Balto-Slavic and Germanic presented by Stang (1972).

4.5.5. Greek

Four Indo-Slavic-Greek isoglosses are found, viz. **h₁ui-d^hh₁-eu-eh₂-* ‘widow’, **dek^m-t-* ‘decade’, **mor-o-* ‘plague’, **oti-loik^w-o-* and ‘leftover, surplus’.

The potential shared element in **h₁ui-d^hh₁-eu-eh₂-* ‘widow’ is the full grade in the suffix, as opposed to zero-grade in Germanic and Celtic. This is a rather trivial development, however, and could be independent. Moreover, it cannot be excluded that Lat. *vidua* f. ‘widow’ also shows full grade in the suffix. As an athematic *t*-stem, **dek^m-t-* ‘decade’ may be an archaism.

Although the proposed semantic innovation in **mor-o-* ‘death’ was rejected for Indo-Slavic, the formation itself constitutes an isogloss with Greek. Similarly, the compound **oti-loik^w-o-* ‘leftover, surplus’ was rejected as an Indo-Slavic formation, but the stem **loik^w-o-* is a possible shared innovation with Greek. However, both cases could be archaisms or independent innovations.

Additionally, three uncertain Indo-Slavic-Greek isoglosses are found. In the case of **b^huHs-* ‘to be active, strengthen’, it is possible that the various attested formations are all independent developments from archaic forms of the root **b^heh₂u-* ‘to become’. The second case is **(t)plh₁-* ‘fort’, which is unclear, since the Baltic word could either be closer to the Greek *i*-stem or the Indo-Iranian root noun. All could go back to the same stem, but this is uncertain. Finally, **k_{or}-H-(keh₂)-* ‘a kind of bird’ is a possible reconstruction that unifies various Greek, Balto-Slavic, and Indo-Iranian bird names, but these words also have different etymologies.

4.5.6. Italic

There are two potential Indo-Slavic-Italic isoglosses in the corpus, which were both classified as uncertain. The stem **m(e)itH-u-* ‘opposed’ has a possible Italic cognate with

unclear ablaut. In the case of **h₁iti* ‘so, in this manner’, the reconstruction is not clear, as the Indo-Iranian form can be connected to either an Italic or Baltic cognate. Alternatively, all forms may be united under a reconstruction **(H)itH*.

4.5.7. Tocharian

Two Indo-Slavic-Tocharian isoglosses are found in the corpus: **klei-e/o-* ‘to lean against (intr.)’ and **tek^w-* ‘to run (of water), flow’. The former may be an oppositional intransitive to **kl-ne-i-*, and is as such a possible shared innovation. The latter is a possible shared semantic innovation, if the root originally meant ‘to run (of people, animals)’. However, it is difficult to exclude that the development went in the opposite direction, or that the original semantic range of the root covered a wider scope, i.e., ‘to run (of water, people, animals)’.

4.6. Indo-Slavic? Innovations, archaisms, and quantity of isoglosses

As the analysis of the isogloss corpus has shown, it is in most cases not possible to exclude beyond reasonable doubt that Indo-Slavic lexical isoglosses are archaisms or independent innovations rather than shared innovations. This is due to the methodological issues surrounding lexical isoglosses, as described in Chapter 2; in most cases, it cannot be excluded that a certain formation did not at one point exist in other branches.¹⁹⁵ However, a small part of the isogloss corpus consists of compelling shared innovations. In these cases, there are compelling arguments against assuming that they ever existed in other branches: **ǵ^hos-to-* ‘hand’, **h₂eǵ-* ‘goat’, **h₂eǵ-ino-* ‘animal skin, leather’, **neih₁-* ‘to churn’, and **som* ‘together, with’. These are few in number, but are most easily explained by assuming a period of shared development after the split of Core Proto-Indo-European but before the Balto-Slavic and Indo-Iranian branch-defining innovations occurred.

Since the number of compelling shared innovations is low, we may instead consider the isogloss corpus from a quantitative perspective. Is the number of Indo-Slavic isoglosses (55) high enough to provide a significant argument in favour of the Indo-Slavic hypothesis? As discussed in 2.2.4, several factors make it difficult to answer that question. First, due to lexical replacement, it is not unexpected that all possible branch pairs show a base-line number of lexical isoglosses due to chance (Meillet 1908: 126). On the basis of the results of this study alone, there is no way of objectively determining whether the number of Indo-Slavic isoglosses surpasses this base-line number. To achieve this, the Indo-Slavic isogloss corpus would need to be compared to corpora of lexical isoglosses shared by other hypothesized subgroups, such as Graeco-Aryan (Martirosyan 2013) or Germano-Balto-Slavic (Stang 1972). However, as the present study has shown, the results of previous studies are in many cases outdated (e.g., Schmidt 1872; Porzig 1954), due to advances in

¹⁹⁵ For example, the shared Indo-Slavic nominal derivatives **d^heh₁i-nu-*, **h₁su-dru-*, **h₂eu-r-eh₁*, **k^uen-to-*, **k^uoit-ó-*, **mosǵ^h-en-*, **ni-h₃(e)k^w-*, **nog^w-o-*, **peh₃i-men-*, **suleh₂-*, **tusk-io-*, **uolk^o-* should not be understood as unlikely shared innovations. On the contrary, they are fully consistent with the Indo-Slavic hypothesis. However, in these cases, we are unable to determine the ancestral state; e.g., **d^heh₁i-nu-* need not have replaced a formation attested in other branches.

the understanding of sound laws and morphological structures of Indo-European languages, as well as in the etymological lexicography of Indo-European languages. Moreover, the evidence for competing hypotheses would have to be studied using the same methodology as applied here to the Indo-Slavic lexical isoglosses to produce a comparable result. Therefore, a comparative study of Indo-Slavic vs. other potential subgroups is not feasible at the moment.

Furthermore, even if the number of Indo-Slavic lexical isoglosses presented here could be compared with that of other branch-pairs, the problem remains that branches may have replaced lexical items at different rates. This implies that a difference in the number of Indo-Slavic lexical isoglosses vs. the number of Graeco-Aryan lexical isoglosses, if such a difference exists, is not necessarily significant (Holm 2003). Thus, as long as the lexical replacement rates are unknown, quantities of lexical isoglosses are inherently difficult to compare. Since the lexicon is not a closed set, statistical modelling of whole-lexicon comparison may not be possible. Yet, naïve quantitative comparison of lexical isogloss corpora (e.g., Indo-Slavic vs. Graeco-Aryan) could offer a supporting role in the argumentation, next to the identification of shared innovations, which provides more foundational evidence for subgrouping.

In sum, qualitative analysis reliably shows a small number of shared innovations of Indo-Iranian and Balto-Slavic to the exclusion of other branches. To assess the weight of the rest of the lexical isogloss corpus, further research needs to investigate whether 1) Indo-Iranian and Balto-Slavic respectively share innovations with other branches that conflict with the shared innovations of Indo-Slavic (e.g., shared innovations of Balto-Slavic and Germanic, where Indo-Iranian preserves the ancestral state); 2) the number of Indo-Slavic isoglosses is disproportionately lower or higher as opposed to other hypothetical subgroups, taking the varying state of attestation of the various branches into account.

4.7. Indo-Slavic and alternative scenarios

As laid out in 1.3, various hypotheses regarding the phylogenetic and dialectal position of Indo-Iranian have been put forward. Here, each hypothesis is evaluated based on the Indo-Slavic lexical isogloss corpus, to determine to what extent the hypotheses are compatible with the shared lexical innovations of Indo-Iranian and Balto-Slavic.

4.7.1. Graeco-Aryan hypothesis

In the Graeco-Aryan hypothesis (Schleicher 1853; 1861; Grassmann 1863a; Kretschmer 1896; Birwé 1956; Euler 1979; Gamkrelidze & Ivanov 1995; Martirosyan 2013), Indo-Iranian forms a subgroup with Greek, which in most cases also includes Armenian and Phrygian. With respect to this hypothesis, an important result of the present study is that the Indo-Slavic lexical isogloss corpus contains shared innovations to the exclusion of Greek and Armenian. Indo-Slavic **ǵʰos-to-* ‘hand’ and **h₂eǵ-* ‘goat’ have been analysed as innovations *vis-à-vis* **ǵʰes-r-* ‘hand’ and **h₂eiǵ-* ‘goat’, which are archaisms shared by Greek and Armenian. Additionally, Greek does not reflect the Indo-Slavic semantic innovation in **neih₁-* ‘to churn’. This implies that the strong version of the Graeco-Aryan

hypothesis, in which Greek, Armenian and Indo-Iranian form an innovation-defined subgroup, may be rejected, as it is inconsistent with the fact that Indo-Iranian shares innovations with Balto-Slavic to the exclusion of Greek and Armenian.

However, most proponents of the Graeco-Aryan hypothesis do not exclude the possibility that the branches involved share innovations with other branches (cf. especially Euler 1979; Gamkrelidze & Ivanov 1995; Martirosyan 2013). If Graeco-Aryan is seen as a non-exclusive dialectal grouping, it is possible to accommodate the Indo-Slavic lexical innovations without rejecting the Graeco-Aryan hypothesis as such. As the discussion in 1.3 has shown, it is unclear whether there are any Graeco-Aryan shared innovations to the exclusion of Balto-Slavic (i.e., where Balto-Slavic retains the ancestral state) which could justify positing a specifically Graeco-Aryan dialect group.

4.7.2. Primary split hypothesis

In the primary split hypothesis (Müller 1853; Lottner 1858a; Fick 1870; Brandenstein 1936; Hamp 1990), Core Proto-Indo-European splits into an Asian (Indo-Iranian) and a European subgroup. Proponents vary as to whether they believe that the European branches form an innovation-defined subgroup in the strict sense (Fick 1870; 1873; Brandenstein 1936), or that there are dialectal groups within the European part of the Indo-European language family, which excludes Indo-Iranian (Hamp 1990).

The Indo-Slavic shared innovations presented in this study imply that the strong version of the primary split hypothesis must be rejected, since Indo-Iranian shares innovations with a European branch that cannot be projected back to the Core Proto-Indo-European stage. Even from a wave model perspective, the results show that Balto-Slavic shares innovations outside of the European group, and it is unclear whether there are any innovations shared by all European branches to the exclusion of Indo-Iranian that would warrant postulating a pan-European dialect group.

Shared European agricultural vocabulary to the exclusion of Indo-Iranian has been used as an argument for a European subgroup (Mommensen 1865; Schrader 1883; Brandenstein 1936). However, while the evidence points to innovations in the European branches (cf. Kroonen et al. 2022), these are never shared by all European branches, e.g., **h₂eg-ro-* ‘cultivated field’ << ‘field of pasture’ (Germanic, Greek, Italic; Indo-Iranian is archaic); **prk(-eh₂)-* ‘furrow’ << ‘gap’ (Celtic, Germanic, Italic; Baltic and Indo-Aryan are archaic). Note that in the latter case, neither Balto-Slavic nor Indo-Iranian participated in the innovation. In other European agricultural terms, neither the archaic nor the innovative state are attested in Indo-Iranian, which implies that it cannot be excluded that Indo-Iranian participated in the innovation, viz. **h₂ek-os-* ‘ear of grain’ << ‘tip of grass’ (Germanic, Italic; Tocharian is archaic); **neik-* ‘to winnow’ << ‘to stir up’ (Celtic, Baltic, Greek; Anatolian and Slavic are archaic); **seh₁-men-* ‘seed’ (Celtic, Balto-Slavic, Germanic, Italic; Anatolian is archaic);¹⁹⁶ **selk-* ‘to plough’ << ‘to draw, pull’ (Germanic, Greek, Italic;

¹⁹⁶ As shown by Skt. *sasyá-* n. ‘corn, grain’ ~ YAv. *hahiiia-* adj. ‘pertaining to grain’ < **se-sh₁-io-*, Indo-Iranian participated in the semantic shift from **seh₁-* ‘to impress’ >> ‘to sow’. Accordingly, it cannot be excluded that **seh₁-men-* was lost in Indo-Iranian.

Armenian and Tocharian are archaic); **sper-* ‘to sow’ << ‘to strew’ (Albanian, Greek; Anatolian is archaic). The case of **grH-no-* ‘cereal’ (Celtic, Balto-Slavic, Germanic, Italic) relies on whether Psht. *záray*, *zúrāy* m. ‘seed, pit’, *zan-γozay* ‘edible pine seed’ (Morgenstierne et al. 2003 s.v.) – which seem to preserve a non-agricultural meaning – really represent a cognate, which is uncertain. In the case of **g^wreh₂-uon-* ‘stone; grinding stone, quern’, ToB *kärweñe* ‘stone, rock’ preserves the basic meaning, whereas Skt. *grāvan-* m. means both ‘pressing stone’ and ‘stone’ in general,¹⁹⁷ which indicates that it participated in the semantic shift seen in Goth. *qairnus* m. ‘quern’, Lith. *gìrmos* f.pl. ‘quern’, Arm. *erkan* ‘quern’ etc., but preserved the polysemy. Finally, in the case of **puH-ro-* > Gr. *πῦρός* m. ‘wheat’ and Lith. *pūrai* m.pl. ‘winter wheat’, Lat. *pūrus* ‘clean’ and OIr. *úr* ‘fresh’ preserve the archaic meaning, whereas Skt. *pāvana-* n. ‘sieve, winnowing basket’ implies that Indo-Iranian participated in the same development from ‘to clean’ >> ‘to winnow’ that is presupposed by Greek and Balto-Slavic, to the exclusion of Italic and Celtic. Thus, there is no obvious dichotomy between Indo-Iranian and the European branches as a whole in terms of agricultural terminology.

4.7.3. Indo-Slavic hypothesis

In the Indo-Slavic hypothesis (Kuhn 1850; Bopp 1853; Ringe, Warnow & Taylor 2002; Kassian et al. 2021), Indo-Iranian and Balto-Slavic form a subgroup within Core Indo-European to the exclusion of the other non-Anatolian branches. The shared innovations among the Indo-Slavic lexical isoglosses provide an important argument in favour of this hypothesis, since the phonological isoglosses often cited as evidence for Indo-Slavic (satemization, RUKI) cannot unambiguously be analysed as shared innovations (cf. 1.3). The Indo-Slavic lexical isoglosses, including the shared innovations, would also be compatible with a wave model scenario, where Indo-Iranian and Balto-Slavic form part of a larger dialectal grouping (Schmidt 1872; Bonfante 1931; Arntz 1933; Porzig 1954), before undergoing their respective branch-defining innovations.

4.7.4. Indo-Balkan hypothesis

In addition to the three main hypotheses on the position of Indo-Iranian, three additional hypotheses will be discussed here and in the two following sections.

Various scholars have proposed a closer dialectal relationship between Indo-Iranian, Balto-Slavic, Albanian, Armenian, Greek, and Phrygian: the so-called eastern Indo-European dialect group (Meillet 1908; Bonfante 1931; Porzig 1954; Meid 1975; Euler 1979). The same group of branches have also tentatively been considered to form a phylogenetic subgroup by Olander (2019) and Søbørg (2020), following Ringe, Warnow & Taylor (2002), which may be termed the Indo-Balkan hypothesis.

Importantly, the results show three shared innovations (**ǵ^hos-to-* ‘hand’, **h₂eǵ-* ‘goat’, and **neih₁-* ‘to churn’) that occur in Indo-Iranian and Balto-Slavic to the exclusion of Greek, Albanian, and Armenian. The latter branches reflect the ancestral states **ǵ^hes-r-* ‘hand’, **h₂eǵ-* ‘goat’, and **(s)neh₁-* ‘to turn, twist’ (only Greek), which means that the

¹⁹⁷ However, the meaning ‘stone’ is attested late (MBh.+) and could be secondary.

Indo-Slavic innovations cannot be back-projected to the hypothetical Indo-Balkan stage. Thus, even if additional evidence for an Indo-Balkan subgroup emerges, such a scenario has to reckon with an Indo-Slavic node further down in the tree structure.

4.7.5. Indo-Balto-Germanic hypothesis

Zeuss (1837) considered Germanic to be the closest relative of Balto-Slavic, and Indo-Iranian as the next closest, whereas Müller (1873) believed that all three branches formed a subgroup, from which Indo-Slavic separated. While this subgrouping scenario, which may be termed the Indo-Balto-Germanic hypothesis, has not since had a prominent position in the literature, Balto-Slavic has often been considered to occupy an intermediate dialectal position between Germanic and Indo-Iranian (Schmidt 1872; Porzig 1954).

Similar to the Graeco-Aryan and Indo-Balkan subgroup hypotheses, an Indo-Balto-Germanic subgroup where Balto-Slavic and Germanic are more closely related is contradicted by Indo-Slavic shared innovations to the exclusion of Germanic. In the case of **neih₁-* ‘to churn’ and **som* ‘together, with’, Germanic reflects the ancestral states **(s)neih₁-* ‘to turn, twist’ and **kom*, respectively. Thus, in a strict tree model, a subgroup with the structure [Indo-Iranian, [Balto-Slavic, Germanic]] may be rejected. As discussed in 1.3, the often-cited case endings in **-m-* do not provide unambiguous evidence for a shared innovation of Germanic and Balto-Slavic to the exclusion of Indo-Iranian.

As remarked in 4.5.4 above, a number of non-exclusive Indo-Slavic isoglosses are shared with Germanic, and could potentially be shared innovations at a hypothetical Indo-Balto-Germanic stage. Furthermore, while Germanic shows the ancestral states of **neih₁-* ‘to churn’ and **som* ‘together, with’, it attests neither the archaic nor innovative state in the case of the remaining Indo-Slavic innovations (**ǵ^hos-to-* ‘hand’, **h₂eǵ-* ‘goat’, **h₂eǵ-ino-* ‘animal skin, leather’), which implies that it cannot in principle be excluded that it participated in them. On the other hand, Germanic and Balto-Slavic have been argued to share a large number of lexical isoglosses (Stang 1972; Mańczak 1980). It remains to be determined if the Germanic-Balto-Slavic isogloss corpus contains shared innovations to the exclusion of Indo-Iranian,¹⁹⁸ or if these isoglosses could instead be back-projected to an Indo-Balto-Germanic subgroup with the structure [[Indo-Iranian, Balto-Slavic], Germanic]. Alternatively, in a wave model scenario, all three branches could be linked in a dialectal grouping, with overlapping shared innovations.

4.7.6. Indo-Balto-Albanian hypothesis

As discussed in 4.5.1 above, a byproduct of the compilation of the Indo-Slavic isogloss corpus is a set of compelling isoglosses shared by Indo-Iranian, Balto-Slavic, and Albanian. Although few in number, this result is striking, since Albanian (just like Armenian) has lost much of the inherited Indo-European vocabulary that is preserved in other branches (Matzinger 2018). Additionally, all five are possible innovations, which could have resulted from a post-Proto-Indo-European period of shared development. This would furthermore be

¹⁹⁸ A potential case is **tuHs-(d)kmt-* > Goth. *þusundi* f. ‘thousand’, Lith. *tūkstantis* m. ‘thousand’, OPr. *tūsimtons* acc.pl. ‘thousand’, OCS *tysoŭsti* f. ‘thousand’, but the etymology is formally problematic (cf. Pijnenburg 1989).

consistent with the fact that Indo-Iranian, Balto-Slavic, and Albanian all undergo satemization.

However, as pointed out in the discussion on the Graeco-Aryan and Indo-Balkan hypotheses, Albanian preserves the ancestral states **ǵ^hes-r-* ‘hand’ and **h₂eig-* ‘goat’ vs. the innovative Indo-Slavic **ǵ^hos-to-* ‘hand’ and **h₂eǵ-* ‘goat’. Thus, in an Indo-Balto-Albanian subgroup scenario, the tree structure would be inferred as [[Indo-Iranian, Balto-Slavic], Albanian].

4.7.7. Conclusion

One of the two main research questions of this study, as laid out in Chapter 1, is whether the lexical isoglosses shared by Indo-Iranian and Balto-Slavic provide evidence for an Indo-Slavic subgroup within Core Indo-European (RQA). As the discussion and analysis of the lexical evidence in this chapter and in Chapter 3 have shown, there are 55 compelling lexical isoglosses shared by Indo-Iranian and Balto-Slavic, of which 5 are compelling shared innovations. The question may thus be answered in the affirmative.

Furthermore, the existence of Indo-Slavic innovations to the exclusion of Greek, Armenian, and Germanic, imply that the two main competing hypotheses on the position of Indo-Iranian, namely the Graeco-Aryan and primary split hypotheses, may be rejected, at least from a tree model perspective.

As discussed in Chapter 2, Dyen (1953) and Clackson (1994) define phylogenetic subgroups as having undergone a high number of shared innovations that clearly set them apart from other parts of the family, whereas a small number of shared innovations point to a dialect group in the disintegrating protolanguage. From this perspective, the Indo-Slavic lexical innovations are most compatible with a dialect group.

However, as pointed out in the discussion on Dyen (1953) and Clackson’s (1994) distinction between subgroups and dialect groups, it is not the number of shared innovations, but rather the existence of overlapping shared innovations that constitutes the fundamental difference between phylogenetic subgroups and dialect groups (cf. Ross 1997). If there are no overlapping innovations between branches, the internal structure of the language family can be adequately described using a tree model where the length of the branches indicates the number of shared innovations. If, on the other hand, there are overlapping innovations that predate the respective branch-defining innovations, the internal structure must include a dialectal period after the split of the protolanguage when certain would-be branches are connected in a dialect continuum, or linkage.

According to this definition, the results of the present study alone do not allow us to determine whether the lexical isoglosses and innovations tying Indo-Iranian and Balto-Slavic together arose in the setting of an exclusive Indo-Slavic subgroup or a dialect linkage that also included other branches of Indo-European. The fact that the evidence for Indo-Slavic is limited to lexical innovations,¹⁹⁹ which would not by themselves have caused

¹⁹⁹ As we have seen, satemization and the RUKI rule may or may not have co-occurred with the Indo-Slavic lexical innovations, and in any case, it is difficult to evaluate to what extent these changes would have made Indo-Slavic unintelligible with centum dialects, if at all. The RUKI rule most certainly would not have hindered mutual intelligibility, as it was a phonetic change with rather limited scope. As for satemization, the situation is more

a break in mutual intelligibility with other Core Indo-European dialects, suggests that it may be most appropriate to speak of an Indo-Slavic linkage, at least for the time being. Future research will be tasked with determining whether there are any compelling shared innovations that link Indo-Iranian and Balto-Slavic to other branches, respectively (e.g., Greek, Armenian, Germanic, and Albanian).

complex. If by “satemization” one refers exclusively to the merger of $*k$ and $*k^w$, while $*k^j$ was retained as a palatal stop vel sim., it might not have significantly hindered mutual intelligibility.

5. The archaeology and genetics of Indo-Iranian prehistory

5.1. Introduction

In section 4.7.7 above, it was concluded that lexical isoglosses shared by Indo-Iranian and Balto-Slavic provide evidence for a period of shared innovation that may be termed Indo-Slavic. As the Indo-Slavic period is intermediate between Core Proto-Indo-European and Proto-Indo-Iranian, it has implications for our understanding of the prehistoric dispersal of the Indo-Iranian languages. The aim of this chapter is to contextualize Indo-Iranian linguistic prehistory from archaeological and genetic perspectives. The focus, on the one hand, lies on the location of the Proto-Indo-Iranian homeland, and, on the other hand, on the dispersal of Pre-Proto-Indo-Iranian from the Proto-Indo-European homeland following the split of the protolanguage. For the latter question, three main scenarios will be presented and evaluated according to their compatibility with the linguistic evidence presented in Chapters 3 and 4. For reference, the most important archaeological cultures discussed throughout the chapter are summarized in Table 2.

	Period	Date (BCE)	Approx. location	Subsistence strategy
Yamnaya	EBA	3300–2600	Pontic-Caspian steppe	Mobile pastoralism (+ mixed farming west of the Dnipro)
Corded Ware	EBA– MBA	3000–2350	Northwest and Northeast Europe	Pastoralism, mixed farming
Fatyanovo- Balanovo (Corded Ware)	EBA– MBA	2900–2050	Northeast Europe, Dnipro to Vyatka- Kama interfluve	Pastoralism, mixed farming
Bactria- Margiana archaeological complex	MBA– LBA	2250–1700	Central Asia, Amu Darya River	Irrigation farming
Abashevo	MBA	2200–1900	Middle Volga to South Urals	Sedentary pastoralism (+ mixed faming?)
Poltavka	MBA	2800–2100	Volga-Ural steppe	Mobile pastoralism
Sintashta	MBA	2100–1800	South Trans-Urals	Sedentary pastoralism
Alakul’- Fëdorovo	LBA	2000–900	Central Asian steppe	Mobile/Sedentary Pastoralism
Srubnaya	LBA	1850–1450	Eastern Pontic- Caspian steppe	Sedentary Pastoralism

Table 2. Summary of archaeological cultures discussed in the chapter. EBA = Early Bronze Age, MBA = Middle Bronze Age, LBA = Late Bronze Age.

5.2. The Indo-European homeland question

Although many homeland hypotheses have been proposed over the years (cf. Mallory 1989: 144), the debate on the Indo-European homeland has in recent decades been centred around the controversy between the Steppe hypothesis, the Anatolian hypothesis, and, albeit to a lesser extent, the Armenian hypothesis (see Gaitzsch & Tischler 2017).²⁰⁰

Proponents of the Steppe hypothesis (Benfey 1875; Tomaschek 1878: 862; Schrader 1890; Gimbutas 1956; Mallory 1989; Anthony 2007), which places the Indo-European homeland north of the Caucasus, between the Black Sea and the Caspian Sea, have relied on linguistic palaeontology as evidence for the connection between Proto-Indo-European culture and Early Bronze Age steppe cultures, termed Yamnaya (“pit grave”). A range of reconstructed terms, including words for wheeled vehicles and domesticated animals, delimit the timeframe of the Proto-Indo-European community to ca. 3500–2500 BCE, in which the Yamnaya culture (3300–2600 BCE, cf. Morgunova & Khokhlova 2013) provides

²⁰⁰ A notable alternative theory is Nichols’ (1997) “Bactria-Sogdiana” homeland, although she has now retracted this hypothesis. Incidentally, a Bactrian homeland was also proposed by Pictet (1859–1863).

a plausible origin for the dispersal of Indo-European to Europe and Asia, respectively (Anthony & Ringe 2015; Anthony 2023b).

Conversely, proponents of the Anatolian hypothesis (Renfrew 1987) have rejected arguments based on linguistic palaeontology as evidence in the homeland question. Their focus has instead lain on explaining the demographic processes behind the spread of the language family, arguing that the expansion of agriculture from Anatolia from ca. 7000 BCE provides a plausible vector for the spread of Indo-European (Bellwood 2001; 2013). Another argument comes from datings of Proto-Indo-European based on Bayesian phylogenetic analysis that are too early (ca. 8000–5000 BCE) to be compatible with the Steppe hypothesis (Gray & Atkinson 2003; Bouckaert et al. 2012; Heggarty et al. 2023). However, the early dating of Proto-Indo-European has largely been rejected by historical linguists, since it is incompatible with the evidence from linguistic palaeontology (Anthony & Ringe 2015; Kroonen et al. 2023). Moreover, the methodology is fundamentally based on the idea that rate of lexical replacement can be used to estimate divergence times of related languages (cf. Swadesh 1952), which is disputed (Bergsland & Vogt 1962; Nettle 1999).

Although the demographic argument was seen as a strong argument in favour of the Anatolian hypothesis, Allentoft et al. (2015) and Haak et al. (2015) have shown that (Indo-European-speaking) European and Central and South Asian populations have received significant gene flow from populations related to Pontic-Caspian steppe groups, forcing archaeologists to reconsider their views on the demographic dynamics between sedentary farmers and mobile pastoralists in prehistory. In fact, migrations of steppe populations caused massive population turnover in many parts of Europe and (to a lesser extent) Asia (Damgaard et al. 2018; Mathieson et al. 2018; Mittnik et al. 2018; Olalde et al. 2018; Narasimhan et al. 2019) on a scale that is compatible with the introduction and subsequent shift to a new language family. Taking the evidence from linguistic palaeontology and archaeogenomics together, the Steppe hypothesis comes out as the most plausible.

Lazaridis et al. (2022) argue that Proto-Indo-Anatolian may originate south of the Caucasus, with the non-Anatolian branches sharing a secondary homeland on the Pontic-Caspian steppe. This hybrid model in some way resembles the Armenian hypothesis (Gamkrelidze & Ivanov 1995), with the crucial difference that Indo-Iranian is still believed to have spread to Central and South Asia from the steppe region, rather than via the Iranian plateau. The advantage of the hybrid hypothesis is that it offers an explanation for the lack of steppe ancestry in Anatolia. However, the near-complete absence of reconstructable agricultural terms in Proto-Indo-Anatolian matches poorly with an Anatolian homeland, since this area was deeply agricultural (Kroonen et al. 2022). Thus, in this work, I place the Indo-European homeland in the 4th millennium Pontic-Caspian steppe.

Ultimately, for the purposes of this study, the difference between the Steppe hypothesis and the hybrid hypothesis of Lazaridis et al. (2022) is essentially inconsequential, since, in both models, the starting point of the Indo-Iranian dispersal (and the Balto-Slavic dispersal, for that matter) is the Early Bronze Age Pontic-Caspian steppe.

5.3. The Sintashta culture as an archaeological context for Proto-Indo-Iranian

The Sintashta culture encompasses around two dozen fortified settlements east of the Ural Mountains that share several material cultural and funerary features. The area is famous for the earliest attestation of the spoke-wheeled chariot in the late 21st century BCE (Lindner 2020). Besides the eponymous Sintashta site (Gening 1979), another major settlement was Arkaim (Kuz'mina 2007: 603). The culture is dated to 2100–1800 BCE (Anthony 2009: 57; Epimakhov, Zazovskaya & Alaeva 2023). It is thus chronologically intermediate between earlier Middle Bronze Age cultures west of the Urals such as Poltavka (2800–2100 BCE) and Abashevo (2200–1900 BCE) and Late Bronze Age cultures in Central Asia such as Alakul'-Fëdorovo²⁰¹ and Srubnaya (1850–1450 BCE).

The economy of the Sintashta culture was centred around pastoralism, as evidenced by the findings of domesticated animals of various species in burials. Judging from the proportion of bones found, the herd of Sintashta groups typically consisted of ~60 % cattle, ~25 % ovicaprids and ~15 % horse (Koryakova & Epimakhov 2007: 88). Single instances of pig or boar are also found, but pigs were not part of the herding economy (Zdanovich & Zdanovich 2002; Kuz'mina 2007: 146). Distinguishing sheep from goats is difficult without DNA analysis, but Kuz'mina (2007: 148) argues that sheep were more frequent than goats and that the latter are not found in burials as sacrificial animals, indicating that goats were less significant. Domesticated animals were a source for meat and milk (Zdanovich & Zdanovich 2002), which is confirmed by stable isotope analysis (Ventresca Miller et al. 2014; Hanks et al. 2018). Additionally, Judd et al. (2018: 11) argue that the lack of caries in individuals from Kamennyy Ambar-5 points to consumption of dairy products.

Although stockbreeding was the main subsistence strategy for the Sintashta population, Kuz'mina (2007: 141) argues that limited cereal farming was practiced as well. The proposed evidence for this consists of the placement of settlements, finds of stone querns, bronze sickles, and grain imprints on tools: all indirect evidence. Moreover, such tools may have been used for wild plants or other activities (Gerling 2015: 244; Mariotti Lippi et al. 2015). Zdanovich & Zdanovich (2002: 255) argue that the lands around Arkaim show traces of irrigation canals, pointing to earlier usage as fields for cultivation. Conversely, more recent studies stress the absence of any direct evidence for cereals in Sintashta settlements (Rühl, Herbig & Stobbe 2015; Judd et al. 2018). Absence of cereals is also supported by the lack of dental caries in Arkaim individuals (Anthony 2007: 405). Anthony mentions that charred millet grains found at Alandskoe have been taken as evidence for consumption of millet, at least at some sites, but widespread millet consumption in the Trans-Urals is not found during the Bronze Age, based on carbon and nitrogen isotope analysis (Ventresca Miller & Makarewicz 2019).

Previous research has drawn connections between Proto-Indo-Iranian and the Sintashta culture (Gening 1979), based on a combination of archaeological, linguistic, and genetic arguments.

²⁰¹ The terms Alakul' and Fëdorovo refer to what in earlier literature is known as the Andronovo culture, which is now regarded as inappropriate by many archaeologists (cf. Grigoriev 2021).

First, by applying a “retrospective approach”, Kuz'mina (2007: 163–64) derives the historically attested Iron Age steppe cultures of the Sauromatians and Saka peoples (who were Iranian-speaking) from the Sintashta culture. This argument is based on shared material cultural elements in these cultures, such as the strong equestrian tradition, similar types of arrows, spears, as well as other tools and weapons. Importantly, also non-functional elements of Sauromatian-Saka material culture have their roots in Sintashta culture, e.g., ceramic ornamentation, burial tradition, and aspects of the traditional dress, such as the pointy hat of the Saka. According to Kuz'mina (2007: 11), non-functional elements point to cultural identity.

Second, besides showing a cultural connection to historical Indo-Iranian-speaking communities, the chronology of the Sintashta culture roughly fits with an approximate dating of Proto-Indo-Iranian based on purely linguistic evidence. On the Indo-Aryan side, the relative chronology of the Vedas establishes the Rigveda (RV) as the oldest (cf. AiGr.), followed by the Atharvaveda (AV). Both clearly reference Panjab toponyms and were thus composed in South Asia (Witzel 1987). For the AV, a *terminus post quem* can be determined based on the mention of iron, which was widely used in South Asia from ca. 1000 BCE (Uesugi 2018: 4).²⁰² The earliest attestation of an Indo-Aryan language from the Mitanni kingdom can be dated to the 15th–14th centuries BCE (Witzel 1995: 99).²⁰³ On the Iranian side, the earliest direct attestation is represented by the Old Persian inscriptions from the 6th century BCE, next to Iranian personal names attested in Assyrian and Babylonian sources (Schmitt 1989: 25). The Avestan Gāthās, which reflect a linguistically more archaic stage than Old Persian, have been approximately dated to ca. 1000 BCE (Kellens 1989: 36). As in the case of the AV, the mention of iron in Avestan (cf. YAv. *hao-safnaēna-* ‘(made) of steel’, lit. ‘good iron’?) can be used to establish a *terminus post quem*. Although the exact geographical origin of the Avesta is unknown, the introduction of iron in the wider region of Iran and Central Asia begins ca. 1250–1000 BCE (Askarov 1999; Danti 2013). Together, the dating of the earliest Old Indo-Iranian texts implies a *terminus ante quem* for Proto-Indo-Iranian around 1500 BCE at the latest. Since the Rigvedic and Gāthic Avestan texts are so similar linguistically, the split cannot have been too long before this date. A split around ca. 2000 BCE fits well with the dating of the Sintashta culture to 2100–1800 BCE.

Third, a *terminus post quem* for Proto-Indo-Iranian can be approximated based on Indo-Iranian chariot terminology. Indo-Aryan and Iranian share a set of terms that can be reconstructed for Proto-Indo-Iranian, including **HratHa-* ‘chariot’, **HratHiH-* ‘chariot driver’, and **HratHai-štaH-* ‘chariot warrior’ (Malandra 1991; Oettinger 1994; Lubotsky 2023). Taken at face value, these words suggest that Proto-Indo-Iranian did not split before the invention of the spoke-wheeled chariot in the 21st century BCE. However, **HratHa-*

²⁰² The introduction of iron likely started already in the second millennium BCE, but was not widespread until after 1000 BCE. See further Uesugi (2018).

²⁰³ For an overview of the Mitanni Aryan language as an Indo-Aryan dialect, cf. Mayrhofer (1961). The Indo-Iranian presence in the Middle East may go back as early as the 18th century BCE, if *šāb ma-ri-ia-nim /šābīša ma-ri-a/ia-nim*, attested in the Leilan letter L.87–887 (cf. Eidem 2014: 142, fn. 16), reflects a Hurrian borrowing of Indo-Iranian **maria-* ‘young man, warrior’.

‘chariot’ is derived from an Indo-European word for (solid) wheel, **HrotHo-*, and could in principle have referred to a more primitive vehicle originally. On the other hand, the specific reference to the **HratHiH-* ‘chariot driver’ vs. **HratHai-štaH-* ‘chariot warrior’ strongly suggests a military context, implying a spoke-wheeled chariot; in the Near East, four-wheeled solid wheel wagons pulled by donkeys or onagers were used in military contexts as early as the 3rd millennium BCE, but there is no evidence for a similar practice in the steppe region (Hüttel 1994). Yet, it is striking that several Indo-Aryan technical terms relating to the spoked wheel, viz. Skt. *ará-* m. ‘spoke’, *nemí-* f. ‘wheel rim’, *paví-* m. ‘metal felly’, are not paralleled in Iranian. Although this is an *argumentum ex silentio*, it could be interpreted as evidence that the split of Indo-Iranian preceded the invention of the chariot (cf. Lubotsky 2023).

Fourth, locating the Proto-Indo-Iranian homeland close to the Ural Mountains is suggested by the many loanwords from early Indo-Iranian into Uralic languages (cf. Holopainen 2019). While many loanwords are from Proto-Iranian or later, there is also a Proto-Indo-Iranian and potentially a Pre-Proto-Indo-Iranian layer (see further 5.4 below), indicating a continuous presence of Indo-Iranian speakers in the Ural region.

Fifth, a layer of loanwords into Proto-Indo-Iranian have been argued to come from an unknown language of the Bactria-Margiana archaeological complex (BMAC) (Lubotsky 2001b). The BMAC civilization was at its peak around 2250–1700 BCE (Lyonnet & Dubova 2021: 32). Around its fortified settlements, the BMAC people practiced irrigation farming, cultivating wheat, barley, lentil, pea, grass pea, chickpea, grape, apple, and flax (Spengler et al. 2014). Domesticated animals include cattle, sheep, camels, pigs, and donkeys (Lyonnet & Dubova 2021: 23–24). Some of the proposed loanwords, e.g., **iauūiā-* ‘canal’, **Hustra-* ‘camel’, **kHara-* ‘donkey’, **kačiapa-* ‘tortoise’,²⁰⁴ can plausibly be connected to the BMAC, and suggest that Indo-Iranians came into contact with BMAC groups from the north rather than the south, as they should otherwise have been familiar with such concepts (Lubotsky 2001b: 307). Contact between BMAC agriculturalists and steppe pastoralists may further be evidenced by finds of Andronovo ceramics in BMAC contexts (Salvatori 2008: 64).²⁰⁵ Finds of cotton at the Sintashta culture settlement Kamennyi Ambar suggest contacts with Central or South Asian cultures (Shishlina, Koryakova & Orfinskaya 2022). The fact that some loanwords show irregular correspondences between Indo-Aryan and Iranian (Lubotsky 2001b; Palmér 2019) suggests that the contact with BMAC groups happened as Proto-Indo-Iranian was disintegrating, postdating the earliest Uralic contacts, which again supports a north to south movement of Indo-Iranian speakers.

Finally, population genomics suggests that steppe ancestry (i.e., ancestry related to Yamnaya steppe herders) spread to South Asia from Central Asian Middle Bronze Age groups around 2000–1500 BCE (Narasimhan et al. 2019: 7). Furthermore, from 2100–1700 BCE, outlier individuals from BMAC sites resemble Central Asian MBA groups

²⁰⁴ The Russian tortoise, *Testudo horsfieldii*, is native to the area of the BMAC (cf. Uetz et al. 2022).

²⁰⁵ However, these ceramics belong to the Tazabag'yab culture, which is no longer considered to be closely related to other so-called Andronovo cultures by some archaeologists (cf. Grigoriev 2021: 5).

(Narasimhan et al. 2019: 4). By comparing modern Iranian-speaking populations and ancient populations of Central Asia, Guarino-Vignon et al. (2022) show that there is genetic continuity from the Iron Age, and that the ancient populations can be modelled as a mix between local BMAC and incoming Central Asian steppe groups. With regards to South Asia (India in particular), a direct link to the Sintashta population is complicated by the fact that the Y-chromosome haplogroup overwhelmingly found in Sintashta is R-Z2124 (Narasimhan et al. 2019: S Table 1), whereas modern Indians with haplogroups related to R1a mostly have R-Y3+ (Underhill et al. 2015). Granted, both subclades are derived from R1a-Z93, but the formation of R-Z2124 and R-Y3 predates the formation of the Sintashta culture (Poznik et al. 2016). It is possible that an unsampled steppe population, autosomally similar to Sintashta, but with different Y-chromosome haplogroups, brought Indo-Iranian to India (cf. 5.4 below).

In sum, a diverse set of arguments support the Sintashta culture as a plausible archaeological proxy for early Indo-Iranians. However, that it would correspond one-to-one to the Proto-Indo-Iranian homeland, from which all subsequent Indo-Iranian languages originate, is doubtful, based on genetic evidence and the uncertainties regarding chariot terminology. As the following section will show, a slightly more complex scenario, involving the Abashevo culture, may be required to explain all the facts.

5.4. The Abashevo culture as an archaeological context for Pre-Proto-Indo-Iranian

When attempting to trace the origins of the Sintashta culture, archaeologists seem to agree on the importance of the Abashevo culture (Anthony 2009). Although previously believed to be older, the Abashevo culture is now radiocarbon dated to 2200–1900 BCE (Molodin, Epimakhov & Marčenko 2014; Mimoxod 2022), preceding the Sintashta culture by just over 100 years. Divided according to the location of sites, three variants are recognized: the Middle Volga, Don-Volga, and South Ural Abashevo culture (Mallory & Adams 1997: 1), the latter overlapping geographically with the Sintashta culture. Parpola (2022) has taken the Abashevo culture as an archaeological proxy for Pre-Proto-Indo-Iranian.

The Abashevo culture followed the kurgan burial custom of the Early Bronze Age Pontic-Caspian steppe cultures and shows evidence of a rich metallurgical tradition with copper and arsenic bronze weapons and tools (Kuz'mina 2021). The economy was mainly pastoralist, with a herd consisting of ~60–70 % cattle, ~10–20 % ovicaprids, and at most 15 % horses and domesticated pigs, respectively (Koryakova & Epimakhov 2007: 65). This is similar to the Sintashta culture (Kuz'mina 2007: 146), except for the inclusion of the domesticated pig. Parpola (2015: 55) has argued that metal sickles and stone querns provide evidence for agriculture, but Kuz'mina (2021) states that there is no direct evidence for farming. Pig husbandry is often taken as an indirect sign of agriculture, since they feed on rest products, but Koryakova & Epimakhov (2007: 65) argue that Abashevo pigs may have been fed acorns instead.

The argument that the Sintashta culture derives from the Abashevo culture is partly based on similarities in material culture. Not only have Abashevo pots been found in Sintashta burials, but the Abashevo ceramic tradition is argued to have influenced Sintashta pottery (Anthony 2007: 382; Koryakova & Epimakhov 2007: 74). Additionally, Sintashta weapons, tools, and adornments show influence from Abashevo precursors (Kuz'mina 2021). The connection between the cultures also makes sense from a geographical-chronological perspective, since the Abashevo culture spread eastward from the Middle Volga region, across the Urals, to the area of the Sintashta culture, shortly before the emergence of the latter (Anthony 2007: 382; Epimakhov 2020; Pärpola 2022: 15).

As for genetic evidence, Engovatova et al. (2023) present the first publication of samples from Abashevo individuals, all male ($n = 14$). Seven individuals carry Y-chromosome haplogroup R1a-Z93 and therefore show a plausible relationship to the Sintashta population.

Furthermore, linguistic evidence for language contact between Indo-Iranian and Uralic languages may support a connection between early Indo-Iranian speakers and the Abashevo culture. As mentioned in 5.3 above, there are loanwords in Uralic from Proto-Indo-Iranian and potentially even from Pre-Proto-Indo-Iranian (Holopainen 2019). The earliest loanwords were likely borrowed into an already dialectally differentiated post-Proto-Uralic stage (Common Uralic), as evidenced by their distribution in the western branches of Uralic, excluding Samoyed. Especially important are Common Uralic **mekši* 'honeybee' and **meti* 'honey', attested in Finnic, Mordvin, Permic, and Hungarian. Due to their vocalism, it has been argued that these words may have been borrowed from the Pre-Proto-Indo-Iranian ancestors of PIIr. **makši*- 'bee, fly', **mad^hu*- 'honey' < Pre-PIIr. **mekši* and **med^hu*-, respectively (Pärpola 2022: 17–18). Since apiculture was not practiced east of the Urals at the time, these loanwords likely entered Common Uralic as speakers migrated west from the Proto-Uralic homeland east of the Urals (Grünthal et al. 2022). Early Uralic speakers were likely associated with the westward spread of the Sejma-Turbino phenomenon (Zeng et al. 2023), dated to 2200–1900 BCE (Marchenko et al. 2017), which came into contact with the Abashevo culture (Černyx & Kuz'minyx 1987).

Although calling this layer of borrowings Pre-Proto-Indo-Iranian is consistent with linguistic reconstruction and archaeological facts, it must be borne in mind that vowel substitutions in Indo-Iranian-Uralic loanwords are notoriously difficult to interpret phonetically (Kümmel 2019). In the case of **makši*- 'bee, fly', since there are no cognates in other Indo-European languages (EWAia II: 287), the reconstruction of Pre-PIIr. **mekši*- rather than **mokši*- is based on Uralic, and therefore not decisive.²⁰⁶ In the case of **meti* 'honey', it is difficult to exclude that Uralic **e* reflects Proto-Indo-Iranian **a*.²⁰⁷ Thus,

²⁰⁶ The same is true for the idea that Common Uralic **ertä* 'side (of the body)' is borrowed from Pre-PIIr. **Herd^ho*- (Holopainen 2019: 81; Pärpola 2022: 18), ancestral to Skt. *árdha*- m. 'side, part, region', *ardhá*- m/n. '(one) half'. No Indo-European cognates confirm the reconstruction of an *e*-grade in the root; rather, the Indo-Iranian situation suggests a nomen actionis **Hord^ho*- 'separation, division' (cf. Lubotsky 1988b: 71, fn. 21).

²⁰⁷ It could be argued that Common Uralic **kekrä* 'circular thing' and **kečrā* 'spindle', corresponding to Skt. *cakrá*- m./n. 'wheel' and *cat(t)ra*- n. 'spindle', provide more convincing evidence that Uralic **e* reflects Pre-PIIr. **e*, since they appear to have been borrowed before the Proto-Indo-Iranian palatalization of **k^(u)* > **č*. However,

while the words plausibly link early contacts between Indo-Iranian and Uralic to the Abashevo-Sejma-Turbino context, determining the linguistic layer as specifically Pre-Proto-Indo-Iranian, as opposed to Proto-Indo-Iranian, must be considered uncertain.

In fact, the view that Sintashta and Abashevo reflect Proto-Indo-Iranian and Pre-Proto-Indo-Iranian, respectively (Parpola 2022), may be overly simplistic. The cultures overlap chronologically and geographically with each other, and even if there is a difference in material culture, this need not correlate one-to-one with the linguistic situation. From the perspective of genetics, as discussed in 5.3 above, the Sintashta population does not provide a perfect fit for Indo-Aryan-speaking groups in South Asia. Since the Abashevo population is, as of yet, much less thoroughly sampled, one might wonder if the missing R-Y3+ haplogroup males, required to explain the prevalence of this haplogroup in India, are hidden here.

To explore this idea further, let us consider an area where the Abashevo culture may be a better archaeolinguistic fit for Proto-Indo-Iranian than the Sintashta culture. Proto-Indo-Iranian inherited two words for ‘domesticated pig’ from Proto-Indo-European, **suH-* and **porko-*, as evidenced on the one hand by YAv. *hū-* m. ‘pig’, MiP Pahl. *hūg* ‘pig’, Oss. I *xoy* / D *xu* ‘pig’, and on the other by YAv. *parsa-* m. ‘pig(let)’, Khot. *pā’sa* ‘pig, hog’.

Skt. *sūkará-* m. ‘boar’ has traditionally been adduced, but the formation is obscure (**sūka-* + *-rá-*?). It is conspicuously similar in form to MiP Pahl. *hūkar(ag)* ‘porcupine’ (MacKenzie 1986: xxii), which could point to a PIIr. **suHkara-* ‘swine; porcupine’ that is etymologically distinct from **suH-ka-* ‘pig’.²⁰⁸ Although usually translated as ‘wild boar’, a specific connotation to wild rather than domesticated pigs is not evident from the earliest attestations:

RV VII.55.4ab

tvám sūkarāśya dardrhi táva dardartu sūkaráh

‘Keep tearing at the boar; let the boar keep tearing at you’ (Jamison & Brereton 2014: 948).

ŚS XII.1.48c

varāheṇa pṛthivī samvidānā sūkarāya ví jihīte mṛgāya

‘...the earth, in concord with the boar, opens itself to the wild hog’ (Whitney 1905: 669)

The phrase *sūkarāya mṛgāya* ‘to the wild *sūkará-*’ could imply that *sūkará-* on its own was semantically underspecified and could refer to either domesticated or wild pigs. This agrees with the Middle and Modern Indo-Aryan material, where the descendants of **sūkará-* vary in meaning, cf. Pā. *sūkara-* m. ‘pig’, Nep. *sūgar*, *sūgur* ‘domesticated pig’, Si. (*h*)*ūrā* ‘boar, wild pig’.

Kümmel (2019) argues that Proto-Indo-Iranian **č* may have been realized as a palatal stop at an early stage, which could have yielded Uralic **k*.

²⁰⁸ In view of the irregular correspondence with YAv. *sukurāna-* m. ‘porcupine’, MoP *sugur(na)* ‘id.’, Wan. *sugun/r* ‘id.’ < **sūkurna-* and Psh. *škuṇ* ‘porcupine’, Bal. *sūkūn*, *sīnkur* ‘id.’ < **sūkurna-* (cf. Morgenstierne et al. 2003), a substrate origin is possible. In that case, the word for ‘porcupine’ may have been related to the word for ‘needle’ in the substrate language, borrowed as Skt. *sūcī-* f. ‘needle’, YAv. *sūkā-* f. ‘needle’ (Lubotsky 2001b), and subsequently folk-etymologically associated with the inherited word for ‘pig’, i.e., **suH(-ka)-*.

Based on the contrastive stem PIIr. **uarāj^ha-* ‘wild boar’ (Skt. *varāhā-* m. ‘wild boar’, YAv. *varāza-* m. ‘id.’),²⁰⁹ PIIr. **suH(-ka)-* and **parčā-* likely referred to domesticated pigs, although perhaps not exclusively. As mentioned in 5.3 above, according to Kuz’mīna single instances of pig or boar bones have been found in Sintashta contexts, but in general she argues that “the complete absence of the pig make[s] up the characteristic feature [...] of Indo-Iranian stock-raising” (Kuz’mīna 2007: 158–59). Koryakova & Epimakhov (2007: 88) report no evidence of domesticated pig at Sintashta sites.²¹⁰ Mallory (1994) argues that this is consistent with the loss of the Indo-European pig words in most Indo-Iranian languages. This assessment is at odds with the reconstructed Proto-Indo-Iranian situation. Conversely, Abashevo sites offer clear evidence that the pig was part of the typical Abashevo herd. It is of course possible that the pig words could have been retained in an exclusively Sintashta-based Proto-Indo-Iranian community, through contact with nearby cultures that did keep domesticated pigs. However, together with the evidence for contact with Uralic, the pig words could be taken as evidence that part of the Proto-Indo-Iranian community should be identified with the Abashevo culture.

Expanding the Proto-Indo-Iranian homeland to include the Abashevo culture seems to be at odds with Proto-Indo-Iranian chariot terminology, however, since the Abashevans did not build chariots. Yet, as the discussion of the linguistic evidence for chariot technology has shown, most technical terms are not shared by Indo-Aryan and Iranian. The few terms that are shared (**HratHa-* ‘chariot’, **HratHiH-* ‘chariot driver’, **HratHai-štaH-* ‘chariot warrior’) are more general, and would also be compatible with a scenario where only parts of the Proto-Indo-Iranian community were building chariots, whereas the rest only knew of their existence (like the Abashevans likely did, given their cultural contact and proximity to the Sintashta culture). Once chariots had been invented, the technology quickly spread to the west of the Urals by the early 2nd millennium BCE (Kuznetsov 2006; Koryakova & Epimakhov 2007: 66; Kuznetsov & Mochalov 2016: 75), so the time gap between the formation of the Abashevo culture around 2200 BCE, the invention of the chariot 2050–2000 BCE, and the dissemination of the technology is rather insignificant.

Thus, two archaeolinguistic lines of evidence contradict each other in being consistent with either the Abashevo culture or the Sintashta culture as the Proto-Indo-Iranian homeland. As the discussion has shown, both the pig words and chariot terms may be explained away as valid linguistic palaeontological arguments by attributing their existence to cultural contacts rather than native cultural practices. Yet, there are other arguments linking both cultures to early Indo-Iranians, and since they are partly overlapping geographically, chronologically, and in terms of material culture, it is possible that the archaeological classification has little or nothing to do with the linguistic situation. Both cultures may represent parts of the Proto-Indo-Iranian homeland.

As argued in 4.4.1 above, Indo-Iranian attests some inherited agricultural terms, which indicate continuous familiarity with farming from Core Proto-Indo-European times.

²⁰⁹ The meaning ‘wild boar’ is supported by Skt. *varāhayú-* adj. ‘wishing for boar, boar-hunting’.

²¹⁰ Furthermore, the pig is not part of the herd in (presumably Indo-Iranian-speaking) Alakul’-Fëdorovo contexts, believed to derive from the Sintashta culture (Koryakova & Epimakhov 2007: 127; Kuz’mīna 2007).

This seems to be at odds with locating the Proto-Indo-Iranian homeland in the Sintashta culture, since there is ample evidence against agriculture being practiced by the Sintashta population (cf. 5.3 above). It is unclear if the hypothesis presented here, i.e., expanding the Proto-Indo-Iranian homeland to include the Abashevo culture, resolves this problem, since the presence of agriculture in the Abashevo culture is debated (cf. above). Even if neither the Abashevo culture nor the Sintashta culture practiced agriculture, it should be noted that these populations would have been in contact with the agriculturalists of the BMAC to the south (cf. 5.3 above), which could alternatively explain the presence of agricultural terms in Proto-Indo-Iranian.

5.5. From Yamnaya to Abashevo and Sintashta

As the previous sections have shown, the prehistory of the Indo-Iranian dispersal can be connected to the Sintashta and Abashevo cultures of the south Ural region in the end of the 3rd millennium BCE. For the preceding period, between the emergence of these cultures and the Indo-European homeland, there are several hypotheses that outline alternative scenarios for how speakers of Indo-Iranian reached the south Ural region.

5.5.1. Scenario 1: Eastward migration hypothesis

The most widely held hypothesis on how (Pre-Proto-)Indo-Iranian spread to the south Ural region is what I call the *Eastward migration hypothesis*. Individual variations aside, its proponents hold that the Proto-Indo-Iranian linguistic community of the south Urals was the result of a (north)eastward migration from the Indo-European steppe homeland during the 3rd millennium BCE. In a way, this may be thought of as the default hypothesis of Indo-Iranian origins, since a direct eastward migration is the shortest route from the steppe to the Ural region. That is not to say that the hypothesis is only based on geographical proximity, however.

Although Gimbutas (1963) connects Indo-Iranian to the Alakul'-Fëdorovo cultures, she makes no explicit mention of how the speakers got there from the Indo-European homeland. Mallory (1989: 263) follows Gimbutas' identification, and adds that the precursor of Indo-Iranian likely developed east of the Volga in the 3rd millennium BCE, corresponding to the Poltavka culture (Mallory & Adams 1997: 440). Also Parpola (2012; 2015; 2022; cf. also Carpelan & Parpola 2001) has explicitly connected Pre-Proto-Indo-Iranian to the Poltavka culture in his scenario of the prehistory of Indo-Iranian. Kuz'mina (2007: 305) agrees that Pre-Proto-Indo-Iranian may be connected to the Poltavka culture.

The Poltavka culture is essentially a Middle Bronze Age descendant of the Yamnaya culture that developed on the steppe between the Volga and Ural rivers ca. 2800–2100 BCE (Chernykh 1992: 132). It continues the kurgan burial tradition of the Yamnaya culture but is characterized by new ceramic styles and an increase in metallurgy. Unlike its contemporaneous western neighbour, the post-Yamnaya Catacomb culture, the copper used in Poltavka mainly came from the Ural region (Chernykh 1992: 133). The pastoralist economy was dominated by ovicaprids, supplemented by cattle and horses (Kuznetsov & Mochalov 2016: 86), and evidence for agriculture is lacking (for the lack of dental caries in

Poltavka individuals, cf. Murphy & Khokhlov 2016: 170–171). Like Yamnaya, the Poltavka culture herders were mobile, which makes an agricultural subsistence all the more unlikely (Anthony 2016: 3–6).

From an archaeological perspective, the Eastward migration scenario makes sense, as both the Abashevo and Sintashta cultures have been argued to show significant influence from the Poltavka culture (Anthony 2007: 383, 386; Parpola 2015: 297; Kuznetsov & Mochalov 2016: 85). The precursor of Indo-Iranian would then have developed in the eastern fringe of the Yamnaya culture, spreading further northeast during the Middle Bronze Age and reaching the Ural region toward the end of the 3rd millennium BCE, forming the Abashevo and Sintashta cultures.

From the perspective of genetics, however, continuity between the Poltavka culture and the Abashevo/Sintashta cultures is much less evident. Poltavka individuals cluster very close to the Yamnaya population (Mathieson et al. 2015; Narasimhan et al. 2019), indicating population continuity between the Early and Middle Bronze Age periods. However, they lack the Early European Farmer component found in Sintashta populations (Mathieson et al. 2015). Furthermore, Poltavka males generally carry Y-chromosome haplogroup R1b, associated with Yamnaya males, specifically the subclade R-Z2103 (Narasimhan et al. 2019: S Table 1). This haplogroup is also found in four samples from an Abashevo context (Engovatova et al. 2023), but is absent from Sintashta samples and later Central and South Asian populations associated with Indo-Iranian speakers.²¹¹ Based on this, the Poltavka population is implausible as a source for the Sintashta culture population and later groups related to the Indo-Iranian dispersal.

However, among the nine sampled individuals from Poltavka sites published by Mathieson et al. (2015) and Narasimhan et al. (2019), there is an outlier (sample I0432) that resembles Sintashta groups, showing admixture between steppe-related and European Farmer-related ancestry and carrying Y-chromosome haplogroup R1a-Z93 (specifically the Sintashta-like subtype R-Z2124, cf. Mathieson et al. 2015: S11). The individual is carbon dated to 2925–2536 calBCE and could provide a genetic link between the Poltavka and Sintashta cultures. According to Mathieson et al. (2015), the lack of additional evidence for this type of ancestry in Poltavka contexts could be explained by assuming that R1a males persisted in the area since the Chalcolithic, but were excluded from kurgan burials. However, in addition to being impossible to prove, this scenario was based on the fact that, at the time, males with Y-chromosome haplogroup R1a-Z93 had not been found elsewhere among ancient Europeans; this changed with Saag et al. (2021), who found ample evidence for such lineages in individuals from the Fatyanovo-Balanovo culture, an eastern extension of the European Corded Ware cultures. The latter population provides a more plausible source for later Central Asian groups such as Sintashta (cf. 5.5.2 below). Still, it is puzzling why a single individual matching the genetic signature of Sintashta groups would appear several hundred years prior to the formation of the Sintashta culture, genetically isolated

²¹¹ Since all but one of the hitherto sampled Abashevo individuals come from the Pepkino mass grave, presumably the result of a battle, it is conceivable that the buried individuals came from different cultural groups.

from the rest of the Poltavka samples.²¹² Importantly, there is no plausible nearby source for the European Farmer-related ancestry found in the Poltavka outlier, making its ancestry type difficult to explain as a local development in the context of the Poltavka culture.

Thus, while some details remain unclear, the overall impression is that the genetic evidence does not mirror the archaeological continuity between the Poltavka culture on the one hand and the Abashevo and Sintashta cultures on the other. This has consequences for the Eastward migration hypothesis that have not been acknowledged by its proponents. Most importantly, if the linguistic origins of Indo-Iranian lie in the context of the Poltavka culture, it requires the assumption of a language shift in the groups that would form the Sintashta culture, since the populations are so divergent genetically. It is difficult to imagine that such a language shift would have taken place without leaving traces in the Sintashta population or subsequent Indo-Iranian-speaking groups. Even in a scenario with language shift in the Sintashta population due to elite dominance of an Indo-Iranian-speaking minority with Poltavka origins, some genetic trace, if not in the autosomal DNA, then in Y-chromosome haplogroups, would be expected.

5.5.2. Scenario 2: via-Corded Ware hypothesis

Genetic evidence betrays a close relationship between the Sintashta population and Corded Ware groups of eastern Europe (Allentoft et al. 2015; Damgaard et al. 2018; Narasimhan et al. 2019). While Yamnaya groups can be modelled as a mix of Eastern Hunter Gatherer and Caucasus Hunter Gatherer ancestry (Allentoft et al. 2015; Haak et al. 2015), it has been argued that an additional ~1/7 Anatolian Farmer ancestry is required (Wang et al. 2019; Lazaridis et al. 2022). In contrast, the Corded Ware population has a larger proportion of Anatolian Farmer-like ancestry, as well as a small amount of Western Hunter Gatherer ancestry (Allentoft et al. 2015; Haak et al. 2015). The Corded Ware population is thought to result from admixture between steppe migrants and European Farmer populations in the late 4th millennium BCE (Papac et al. 2021; Ringbauer et al. 2024).²¹³ In the eastern Corded Ware populations belonging to the Fatyanovo culture, the Anatolian Farmer-like ancestry component makes up ~33 % of the genetic ancestry, and all sampled male individuals carry Y-chromosomes of haplogroup R1a-Z93 (Saag et al. 2021). This is strikingly similar to the Sintashta population, which shows similar levels of Anatolian Farmer-like ancestry and the same predominance of Y-chromosome haplogroup R1a-Z93 among males.²¹⁴ R1a-Z93 males have now also been found in an Abashevo context (Engovatova et al. 2023). Since the earliest sampled Fatyanovo individuals are carbon dated hundreds of years before the

²¹² One possible explanation is that the carbon dating is wrong, and that the Poltavka outlier (I0432) in reality belongs to a later layer (after 2200 BCE). Apparently, the grave from which the individual was excavated was cut through by a later burial associated with the Middle Bronze Age Potapovka culture (Mathieson et al. 2015: S11).

²¹³ The origin of the Corded Ware genetic ancestry profile is a hotly debated topic. The fact that Corded Ware males carry Y-chromosomes of haplogroup R1a, which is unknown in Yamnaya males (where haplogroup R1b is predominant), suggests that the steppe ancestry component in Corded Ware individuals is not identical to that of Yamnaya populations. However, Ringbauer et al. (2024) have shown that Corded Ware individuals share IBD segments with Yamnaya individuals, which proves that they share ancestors only a few hundred years back.

²¹⁴ The same traits are found in modern South Asian populations, albeit with significant admixture with other ancestry groups and more Y-chromosome haplogroup variation among males (Narasimhan et al. 2019).

emergence of the Abashevo and Sintashta cultures (Saag et al. 2021), these can plausibly be explained as resulting from migrations of Fatyanovo groups.

The *via-Corded Ware hypothesis* can also be supported by archaeological evidence. Long before aDNA evidence had become available, archaeologists described connections between Corded Ware cultures and the Abashevo culture, seen as an off-shoot from the eastern Corded Ware cultures otherwise known as Fatyanovo-Balanovo (Gimbutas 1965: 605; Anthony 2007: 380ff; Kuz'mina 2007: 305; Nordqvist & Heyd 2020). As discussed in 5.3–5.4 above, the Sintashta culture is closely related to the Abashevo culture, and may therefore be considered to be indirectly related to the Corded Ware complex.

The Fatyanovo and Balanovo cultures make up the eastern part of the Corded Ware horizon, which stretches across the northern half of Europe from the Netherlands to the Volga, occupying the forest-steppe zone. The traditional view has been that the Fatyanovo culture formed as a result of western impulses from central Europe (possibly mediated via the Middle-Dniepr culture, cf. Anthony 2007: 380). Although the chronological difference is small, this view seems to be supported by recent radiocarbon dating, which gives 2900 BCE as an upper boundary for Fatyanovo (Saag et al. 2021), compared to the earliest finds of Corded Ware in Bohemia dating as far back as 3000 BCE (Papac et al. 2021). The latest dated Fatyanovo individual has a lower boundary of 2047 BCE (Saag et al. 2021), and there are charcoal remains dated between the 22nd and 18th centuries BCE, but in general most dates cluster around the early to middle 3rd millennium BCE (Nordqvist & Heyd 2020).

The Fatyanovo culture is mainly known from burials, which (unlike in the Abashevo and Sintashta cultures) are flat earth graves containing various grave goods, but only rarely metal objects (for an overview, cf. Nordqvist & Heyd 2020). Kurgan burials are found further east in Balanovo contexts, which possibly reflects influence from steppe cultures. The Balanovo culture is also characterized by the existence of settlements, which appear to be absent from Fatyanovo. Evidence for copper metallurgy is solid but not abundant, and is stronger in the area of the Balanovo culture closer to the Ural region. The subsistence strategy of Fatyanovo-Balanovo groups is debated. It seems clear that these Corded Ware groups were the first pastoralists in the forest-steppe zone of eastern Europe, with evidence for pigs, ovicaprids, cattle and horses. It has generally been assumed that Fatyanovo-Balanovo groups practiced agriculture, but there is little to no hard evidence for it, perhaps owing, at least partly, to the scanty attestation of settlements.

In linguistic terms, the *via-Corded Ware* scenario implies that Indo-Iranian would have formed in a linguistic community deriving from groups of Indo-European speakers who moved into central Europe at the turn of the 4th–3rd millennium BCE, forming the Corded Ware cultures. As these groups expanded to the northeast, forming the Fatyanovo-Balanovo cultures, the first specifically Indo-Iranian sound changes may have occurred toward the end of the Balanovo horizon, or in the context of the Abashevo culture (i.e., ca. 2300–2100 BCE). In this scenario, the Poltavka culture, which also influenced both Abashevo and Sintashta culturally, would not have been linguistically Indo-Iranian, but would rather reflect other Indo-European-speaking groups, who may eventually have assimilated linguistically to Indo-Iranian in the 2nd millennium BCE.

The Fatyanovo culture has been associated with Balto-Slavic, often specifically Baltic speakers (Gimbutas 1956: 163; Carpelan & Parpola 2001: 88; Anthony 2007: 380; Kuz'mina 2007: 305; Parpola 2022: 13). Given the results of Chapters 3–4, showing evidence for a period of Indo-Slavic shared innovation, it becomes possible to view the Fatyanovo culture as a plausible archaeological context for the Indo-Slavic linkage (cf. Narasimhan et al. 2019).

5.5.3. Scenario 3: Bell Beaker hypothesis

The origin of the Abashevo culture has played a crucial role in the Eastward migration and via-Corded Ware hypotheses, since it is seen as the immediate ancestor of the Sintashta culture. Most archaeologists have considered the Abashevo culture to contain elements derived from the Corded Ware cultures as well as the Poltavka culture. There is another hypothesis, however, which contends that the Abashevo culture arose following a migration of Bell Beaker people from central Europe.

Without completely rejecting the idea of influence from local predecessors, Mimoxod (2022) argues that the Middle Volga Abashevo culture is “fundamentally different from the previous substrate, which is represented by the Fatyanovo culture” (p. 122). He argues that the Abashevo burials with wooden coffins and kurgans surrounded by pillar fences find parallels in Moravian and other central European Bell Beaker sites, but not in any local cultures of eastern Europe. The Abashevo kurgan tradition is argued to be partly due to steppe influence, however. Unlike previous researchers, Mimoxod rejects any continuation of Fatyanovo ceramics in the Abashevo culture.

The formation of the Abashevo culture just after 2200 BCE coincides with the 4.2 ka BP climatic event, which was a period of global climate change causing increased wintertime precipitation in higher latitude areas and aridization in lower latitude areas (Mimoxod et al. 2022). These conditions pushed pastoralists in parts of Europe to seek winter pastures in areas such as the Pontic-Caspian steppe. Mimoxod et al. (2022) hypothesize that Bell Beaker groups from the Carpathian basin for this reason migrated to the Middle Volga region, forming the Abashevo culture. However, apart from being the closest area from which Bell Beakers could have migrated to the Middle Volga, there is no independent evidence that the migration would have come from the Carpathian region.

If the formation of the Abashevo culture was the result of a migration of Bell Beaker groups from central Europe, this should have left a signal in the genetic ancestry of the Abashevo population. However, seven of the 14 Abashevo samples published so far carry Y-chromosomes of haplogroup R1a-Z93 (Engovatova et al. 2023), which is rather associated with Corded Ware groups of the Fatyanovo culture (Saag et al. 2021), as well as later Sintashta groups and other populations linked to Indo-Iranian speakers (Narasimhan et al. 2019). Bell Beaker people from central Europe would be a poor fit as a source for these populations, since they tend to have lower proportions of steppe-like ancestry (~46 %) and higher proportions of Anatolian Farmer-like ancestry (~43 %) compared to Sintashta individuals (Olalde et al. 2018). It remains possible that it was an unsampled Bell Beaker group, whose ancestry profile more closely resembled that of Sintashta/Corded Ware

groups, that formed the Abashevo culture. However, for the time being, the migration assumed by Mimoxod (2022) cannot be considered supported by genetic evidence.

From a linguistic perspective, the *Bell Beaker hypothesis* would imply that Pre-Proto-Indo-Iranian was spoken somewhere in central Europe, perhaps in the Carpathian region, until just before 2200 BCE, from where it spread to the Middle Volga region. Unlike in the via-Corded Ware scenario, where Pre-Proto-Indo-Iranian is part, albeit on the eastern margins, of the Indo-Europeanization of central Europe, the Bell Beaker scenario places Indo-Iranian in central Europe proper until almost a millennium after the dissolution of Core Proto-Indo-European, in a cultural context that otherwise has mostly been associated with Celtic and Italic groups (e.g., Anthony 2007: 367).

5.6. Integration with linguistic evidence

Having presented three hypotheses on the origins of Indo-Iranian based on archaeological and genetic evidence, the aim of this section is to determine which scenario is the most consistent with the linguistic evidence.

The present study has shown that Indo-Iranian shares a substantial set of unique lexical isoglosses with Balto-Slavic, of which at least five are shared innovations. If the conclusion of Chapter 4 is accepted, an Indo-Slavic linkage must have existed somewhere in space and time between the split of Core Proto-Indo-European (before 3000 BCE) and Proto-Indo-Iranian (after 2200 BCE).

In the Eastward migration scenario, Indo-Iranian developed on the eastern fringe of the Indo-European homeland, associated with the Poltavka culture, and subsequently the Abashevo culture. Parpola (2022: 15) argues that isoglosses shared by Indo-Iranian and Balto-Slavic, such as the RUKI rule, resulted from language contact between (Pre-Proto-)Balto-Slavic-speaking Fatyanovo-Balanovo groups and (Pre-Proto-)Indo-Iranian-speaking Abashevo groups. However, there is no indication that the RUKI rule would have been a contact-induced phenomenon rather than an inherited development. As argued in Chapter 1, the RUKI rule may be an old sound change that failed to phonologize in other branches. Similarly, satemization cannot plausibly be explained as a contact-induced change in a Fatyanovo-Balanovo-Abashevo context, since it also includes Armenian and Albanian, which are unlikely to ever have been spoken in the Middle Volga region (cf. Thorsø 2023). As for the Indo-Slavic lexical isoglosses, there is no indication that they would have resulted from contact, since they predate all branch-specific sound changes. In any case, a scenario where the shared Indo-Slavic features, whether contact-induced or vertically transmitted, developed in the Middle Volga region requires all attested descendant languages to originate from there. This does not seem likely for Balto-Slavic, for which a more western homeland has been proposed (Gimbutas 1956: 163; Anthony 2007: 380; Kuz'mina 2007: 305).

Additionally, the Indo-Slavic lexical isoglosses include two probable agricultural terms (**dʰoH-neh₂-* ‘grains’ and **pelH-ou-* ‘chaff’, cf. 4.4.1). This makes the Poltavka culture and the Middle Volga region problematic as a staging ground for the Indo-Slavic linkage, since there is no evidence for cereal cultivation in the steppe east of the Dnipro

during the Early to Middle Bronze Age (Rassamakin 1999: 152; Cunliffe 2015: 96; Kuznetsov & Mochalov 2016; Murphy & Khokhlov 2016). Similarly, the agricultural terms inherited from Core Proto-Indo-European in Proto-Balto-Slavic and Proto-Indo-Iranian, such as **h₂erh₃-* ‘to plough’ (cf. 4.4.1), suggest that both branches originate from the western part of the Indo-European homeland, west of the Dnipro (Kroonen et al. 2022).

In the via-Corded Ware scenario, the Indo-Slavic linkage may be correlated with the northeastward expansion of the Fatyanovo culture from western Ukraine, starting around 2900 BCE and reaching the Middle Volga region well before the end of the 3rd millennium BCE. This fits well with the chronological boundaries of Indo-Slavic (ca. 3000–2200 BCE) determined by the split of Core Proto-Indo-European and emergence of Proto-Indo-Iranian. Moreover, this scenario is compatible with the agricultural vocabulary of Indo-Iranian, in the sense that Indo-Iranian would ultimately originate in the agricultural western Ukraine, the proposed homeland of Core Indo-European (Kroonen et al. 2022). As for the Fatyanovo culture itself, direct evidence for cereal cultivation is lacking, but archaeologists tend to believe that agriculture played a role in its subsistence, based on indirect evidence (Nordqvist & Heyd 2020). Furthermore, it could be argued that familiarity with agriculture is implied by the fact that the Fatyanovo population shows substantial admixture with a European Farmer-like population (Saag et al. 2021).

Additionally, in the via-Corded Ware scenario, if satemization is taken as a shared innovation of the satem branches, this would have to have occurred in the late 4th or early 3rd millennium BCE, in a disintegrating Core Proto-Indo-European-speaking western Ukraine. This could be consistent with the dispersal of Armenian, which has been argued to originate in a western post-Yamnaya Catacomb culture context (Anthony 2007: 92; Thorsø 2023).

In the Bell Beaker scenario, Pre-Proto-Indo-Iranian speakers would have been situated in central Europe until a rapid migration displaced them to the Middle Volga region around 2200 BCE. In principle, this is compatible with the existence of an Indo-Slavic linkage; since the Bell Beaker phenomenon was likely multi-ethnic, not being correlated closely with a single genetic population type, it is possible that Indo-Slavic speakers carried Bell Beaker culture without showing significant linguistic affiliations to other Indo-European groups usually connected to the Bell Beaker phenomenon, such as Celtic and Italic (cf. Anthony 2007: 367). However, it is not the most attractive scenario. As for the Indo-Slavic and Indo-Iranian agricultural vocabulary, it is compatible with a central European context, as presupposed in the Bell Beaker scenario, since cereal cultivation is attested here (cf. Heyd, Husty & Kreiner 2004).

Aside from agricultural vocabulary, another linguistic palaeontological variable is represented by words for ‘pig’. As discussed in 5.4 above, Proto-Indo-Iranian inherited both **suH-* ‘pig’ and **porko-* ‘pig(let)’ from Core Proto-Indo-European, indicating familiarity with domesticated pigs. Interestingly, pig husbandry is not mentioned as a feature of the Poltavka culture (Cunliffe 2015: 96; Kuznetsov & Mochalov 2016), but is securely attested in the Fatyanovo culture (Nordqvist & Heyd 2020), which seems to favour the via-Corded Ware hypothesis. The Bell Beaker hypothesis is more difficult to evaluate from this perspective, since the exact location of the Pre-Proto-Indo-Iranian community in this

scenario is unclear, but pig husbandry was likely present in most of central Europe (Caliebe et al. 2017). It may of course be argued that the Poltavka population could have words for ‘pig’ without breeding them, in which case the evidence would not be incompatible with the Eastward migration scenario. However, the Proto-Indo-Iranian pig words are more consistent with the via-Corded Ware or Bell Beaker hypotheses.

A third line of evidence that may be indicative of the migration route of Pre-Proto-Indo-Iranian speakers is substrate words, i.e., words borrowed from non-Indo-European languages in prehistory. All branches of Core Indo-European in Europe, including Armenian, have been argued to share substrate words that may have been borrowed from pre-Indo-European languages of hunter-gatherer and farmer populations of Europe (cf. Schrijver 1997; Kroonen 2012; Jakob 2023a; Thorsø 2023; Wigman 2023 with lit.). A defining feature of most substrate words is formal irregularities that preclude a Proto-Indo-European origin. Many substrate words belong to semantic fields such as local flora and fauna, as well as agricultural terminology. Although they are in the minority, some substrate words are attested in branches whose historical locations are far apart, indicating that they were borrowed at a time when the branches were still located in closer proximity to each other.

If the Indo-Iranian branch originates from Indo-European populations that migrated to central or eastern Europe, before spreading east to the Ural region, as proposed in the via-Corded Ware and Bell Beaker hypotheses, we would expect to find traces of substrate words shared with European branches in Indo-Iranian languages. An exhaustive study is beyond the scope of this work, but a few potential cases may be discussed.²¹⁵ First, the Indo-Slavic isogloss **h₂eǵ-* ‘goat’ was argued to be a borrowing, with an irregular correspondence **h₂eiǵ-* ‘goat’ in Greek, Albanian, and Armenian (cf. 3.2.2). Although the meaning – seemingly belonging to a pastoralist semantic field – is not typical for a European substrate word, it represents a possible case linking Indo-Iranian to a European context. As for words with agricultural meaning, as discussed in 4.4.1, Iranian **H(a)rab^(h)anTa-* ‘chickpea’ and **(H)(a)uić-* ‘oats’ are possible comparanda of the European substrate words Gr. ἐρέβινθος m. ‘chickpea’ and PSl. **ovъsъ* m. ‘oats’, respectively. Especially **H(a)rab^(h)anTa-* ‘chickpea’ is difficult to reject, given the formal and semantic similarity to Greek. However, given its isolated attestation in a few Pamir languages and absence from Old Indo-Iranian languages, it is uncertain whether it goes back to Proto-Indo-Iranian. Another possible substrate word shared with a European branch is Skt. *kapāla-* n. ‘bowl, skull’ ~ OE *hafola* m. ‘skull’ < **kapolo-*, cf. also Lat. *caput* n. ‘head’ (EWAia I: 300). Given the required reconstruction of **a*, this is unlikely to be a native Indo-European word (Lubotsky 1989). However, since Skt. *kapāla-* structurally resembles substrate words from a later, post-Proto-Indo-Iranian stratum (Lubotsky 2001b),²¹⁶ it may be a much younger borrowing. In a similar semantic field, there is Skt. *kumbhā-* m. ‘jar, pitcher’, YAv. *xumba-* m. ‘pot’, which may be compared to Gr. κύμβη f.

²¹⁵ Indo-Iranian languages have been argued to reflect a Central Asian substrate, associated with the BMAC (Lubotsky 2001b; Witzel 2003).

²¹⁶ I.e., the “trisyllabic nouns with long middle syllable” (Lubotsky 2001b: 303).

‘cup, bowl’ (cf. EWAia I: 370). However, the Sanskrit and Avestan words do not match formally (**k-* vs. **kH-*),²¹⁷ suggesting that they were borrowed after the split of Proto-Indo-Iranian. In this case, they cannot be projected back to a European context.

Thus, there are some possible European substrate words in Indo-Iranian, although only **h₂eǵ-* ‘goat’ may be securely back-projected to Proto-Indo-Iranian, given its Indo-Slavic origin. In this sense, the Indo-Iranian situation is not entirely incompatible with the via-Corded Ware and Bell Beaker hypotheses. However, the substrate material appears much more limited in comparison to the European branches, which can be taken as an argument in favour of the Eastward migration hypothesis, where Pre-Proto-Indo-Iranian speakers remained far away from the pre-Indo-European linguistic landscape of Europe.

Yet, a caveat for this discussion is that it is unclear exactly when most substrate words were adopted into the European branches. The formation of the Corded Ware population, resulting from admixture between steppe populations and European Farmers (Papac et al. 2021; Ringbauer et al. 2024), is a plausible scenario for the adoption of some of the earliest substrate words. However, some substrate words show irregular correspondences within branches, e.g., PSl. **ovbs̃* m. ‘oats’ vs. Lith. *aviža* f. ‘oats’, suggesting that they reflect a later stratum of loanwords. Accordingly, the question is to what extent substrate words from the earliest stratum would show formal irregularities between the branches, or if such words would rather appear as regular Indo-European etyma. For example, Indo-Slavic **dʰoH-neh₂-* ‘grains’ has no compelling Indo-European etymology, and could reflect an early borrowing just like Indo-Slavic **h₂eǵ-* ‘goat’. More research is needed to clarify the origins of European substrate words, as well as to what extent such words are reflected in Indo-Iranian.

Following the above discussion, a summary of the compatibility of the three hypotheses on the Indo-Iranian dispersal with linguistic, archaeological, and genetic evidence is presented in Table 3.

²¹⁷ The Sanskrit and Avestan words can only be reconciled if one assumes that Grassmann’s Law affected voiceless aspirates, i.e., **kHumbʰa-* > **kʰumbʰa-*, or by assuming that Avestan underwent aspiration metathesis, i.e., **kHumba-* > **kʰumba-* > **kumbʰa-*.

	Linguistics				Archaeology	Genetics
	Indo-Slavic lexical isoglosses	Ilr. agricultural terminology	Ilr. pig words	Scarcity of Eur. substrate in Ilr.	Succession of archaeological cultures	Population continuity
Eastward migration	–	–	–	+	+	–
Via-Corded Ware	+	+	+	?	+	+
Bell Beaker	+	+	+	?/–	+	–

Table 3. Interdisciplinary compatibility of three hypotheses on Indo-Iranian origins.

To begin with, all three hypotheses are in principle compatible with the archaeological record, since the Abashevo and Sintashta cultures have been argued to be successors of the Poltavka culture, Fatyanovo culture, or Bell Beaker culture, respectively. However, when we incorporate population genomics into the picture, only the connection between the Fatyanovo culture and the Abashevo and Sintashta cultures correlates clearly with genetic evidence. With the caveat that the details surrounding the Poltavka outlier individual are still unclear (cf. 5.5.1), the Poltavka population does not seem to contribute to the genetic ancestry of Abashevo and Sintashta populations. This suggests that the influences of Poltavka material culture on Abashevo and Sintashta resulted from cultural contacts rather than migration. As for the Bell Beaker scenario, it does not seem compatible with the current genetic evidence.

Of the linguistic variables discussed, the Eastward migration hypothesis is inconsistent with Indo-Iranian agricultural terminology and pig words, since neither agriculture nor pig husbandry are features of the Poltavka culture. Similarly, the Poltavka culture does not provide a plausible context for the Indo-Slavic linkage, since the lexical isoglosses contain words with probable agricultural semantics. Conversely, the via-Corded Ware and Bell Beaker hypotheses seem consistent with the Indo-Slavic lexical isoglosses, as well as Indo-Iranian agricultural terminology and pig words. The one variable where the Eastward migration hypothesis has an edge over the other two is in the scarcity of European substrate words in Indo-Iranian. However, as discussed above, Indo-Iranian has a few potential European substrate words, which is why the compatibility of the via-Corded Ware hypothesis is marked with a question mark here. Perhaps the scarcity of European substrate words is most problematic for the Bell Beaker hypothesis, since in this scenario Pre-Proto-Indo-Iranian is argued to be situated in central Europe for hundreds of years following the split of Core Proto-Indo-European, whereas in the via-Corded Ware hypothesis it is associated with the Fatyanovo culture on the eastern fringes of Europe.

Thus, with regards to research question B (cf. 1.4), based on the results of the present study, the via-Corded Ware hypothesis is the most consistent with the combined evidence from linguistics, archaeology, and genetics. While the linguistic evidence previously adduced in favour of this scenario (i.e., satemization, RUKI rule, cf. Narasimhan et al. 2019) was determined to be ambiguous in Chapter 1, the Indo-Slavic lexical isoglosses present additional evidence in its favour, which, combined with linguistic palaeontological considerations, is consistent with an Indo-Slavic linkage that is correlated archaeologically and genetically with the Fatyanovo-Balanovo culture in the eastern Corded Ware horizon. A model of the prehistoric dispersal of Indo-Iranian based on this scenario is presented below (Figure 13).

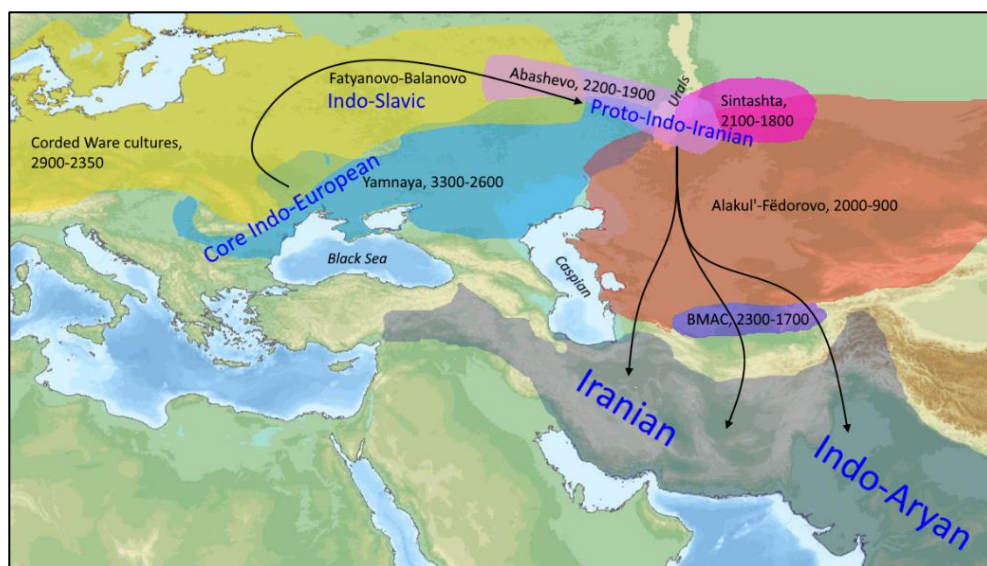


Figure 13. Model of the prehistoric dispersal of Indo-Iranian in the via-Corded Ware scenario. Archaeological cultures are given with dates BCE. Names for the chronological stages in the development from Core Indo-European to Indo-Iranian are indicated in blue. Approximate dispersal route of Indo-Slavic and Indo-Iranian is marked with arrows.

5.7. Limitations and outlook

The aim of this work has been to investigate the prehistoric dispersal of Indo-Iranian, specifically in the period between Core Proto-Indo-European and Proto-Indo-Iranian, by studying the phylogenetic relationship between Indo-Iranian and Balto-Slavic. The study of lexical isoglosses shared by these branches resulted in the postulation of a period of shared innovation that may be referred to as the Indo-Slavic linkage.

The discussion in 5.6 above has argued that the Indo-Slavic linkage is consistent with a scenario in which Indo-Iranian did not spread directly eastward from the Core Indo-European homeland, but rather moved to northeast Europe during the 3rd millennium BCE and gradually spread eastwards to the Ural region. However, as concluded in Chapter 4, the

phylogenetic position of Indo-Iranian and Balto-Slavic with respect to the other branches, particularly Greek and Germanic, is still to be determined. If Indo-Iranian and Balto-Slavic can be shown to also share innovations with other branches, this must be taken into account in hypotheses on their prehistoric dispersal. The possibility of Indo-Balto-Germanic shared innovations can probably be accounted for in the *via-Corded Ware* hypothesis, since Germanic has also been connected to the Corded Ware horizon (Anthony 2007: 360). On the other hand, Greek and Armenian have generally not been associated with the Corded Ware cultures, but rather with the Catacomb culture, developing out of the western Yamnaya horizon (Anthony 2007: 368; Clemente et al. 2021; Thorsø 2023). Therefore, if Indo-Iranian can be shown to share innovations with these branches to the exclusion of Balto-Slavic, this may have implications for the *via-Corded Ware* hypothesis.

The attempt to connect the Indo-Slavic and Proto-Indo-Iranian linguistic communities to archaeological contexts has utilized the methodology known as linguistic palaeontology. In some cases, it proved difficult to find linguistic material that could disambiguate between archaeological cultures. For example, Indo-Slavic was argued to have five unique terms related to dairy production (cf. 4.4.2), but since all relevant archaeological cultures (Yamnaya, Poltavka, Fatyanovo, Abashevo, Sintashta) likely used dairy products as part of their subsistence, the linguistic evidence is not very informative. In other cases, however, the linguistic material was able to provide important insights when compared to the archaeological record. Words relating to chariots and apiculture allowed the Proto-Indo-Iranian homeland to be correlated with the Abashevo and Sintashta cultures. In the Pre-Proto-Indo-Iranian period, agricultural terms and pig words point in favour of the Fatyanovo culture over the Poltavka culture. Yet, as the discussion of these semantic fields has shown, the material is often compatible with conflicting interpretations, due to the limitations of semantic reconstruction. In particular, the distinction between wild and domesticated cereals and animals is often difficult to establish with a high degree of certainty. In these cases, it is rather a matter of determining the most probable interpretation, and comparing this to other lines of evidence (from linguistics, as well as archaeology and genetics), keeping in mind that new material may appear in the future that strengthens or weakens the chosen interpretation.

This thesis has explored how linguistic considerations relating to phylogenetic subgrouping and linguistic palaeontology can be correlated to archaeological and genetic evidence, in order to reconstruct the prehistoric dispersal of the Indo-Iranian branch. It is hoped that future research will be able to fill the remaining gaps regarding Indo-European phylogeny that limit the conclusions of this study, as well as further refine the reconstruction of Eurasian population genomics, in order to reach a more complete understanding of Indo-European prehistory.

6. Bibliography

6.1. Abbreviated works²¹⁸

Abaev I–IV	Abaev, Vasilij I. 1958–1989. <i>Istoriko-ètimologičeskij slovar' osetinskogo jazyka</i> . 4 vols. Moskva: Izdatel'stvo akademii nauk SSSR.
AiGr.	Wackernagel, Jakob & Albert Debrunner. 1896–1957. <i>Altindische Grammatik</i> . 3 vols. Göttingen: Vandenhoeck & Ruprecht.
AirWb.	Bartholomae, Christian. 1904. <i>Altiranisches Wörterbuch</i> . Strassburg: Karl J. Trübner.
DCECH	Corominas, Joan & José A. Pascual. 1980–1991. <i>Diccionario crítico etimológico castellano e hispánico</i> . 6 vols. Madrid: Editorial Gredos.
eDIL	Toner, Gregory, Maire Ní Nhaonaigh et al. (eds.). 2019. <i>An Electronic Dictionary of the Irish Language</i> , based on the Contributions to a Dictionary of the Irish Language (Dublin: Royal Irish Academy, 1913–1976). URL: www.dil.ie 2019.
ESIJ	Rastorgueva, Vera S. & Èdel'man, Džoj I. 2000–. <i>Ètimologičeskij slovar' iranskix jazykov</i> . 6 vols (2024). Moskva: Nauka.
ESSJ	Trubačev, Oleg S., Andrej A. Žuravlev. 1971–. <i>Ètimologičeskij slovar' slavjanskix jazykov</i> . 42 vols. Moskva: Nauka.
EWAia	Mayrhofer, Manfred. 1992–2001. <i>Etymologisches Wörterbuch des Altindoarischen</i> . 3 vols. Heidelberg: Carl Winter Universitätsverlag.

²¹⁸ Here and in 6.2, publications in Russian have been transliterated into the Latin alphabet according to the academic transliteration style. Publications in English by Russian authors follow the transliteration style of the publication.

- EWD Pfeifer, Wolfgang et al. 1993. *Etymologisches Wörterbuch des Deutschen, digitalisierte und von Wolfgang Pfeifer überarbeitete Version im Digitalen Wörterbuch der deutschen Sprache*. URL: <https://www.dwds.de/wb/etymwb/search?q=>.
- FEW von Wartburg, Walter, Margarete Hoffert, Carl T. Gossen, Jean-Pierre Chambon, Jean-Paul Chauveau. 1922–2003. *Französisches etymologisches Wörterbuch: eine Darstellung des galloromanischen Sprachschatzes*. 29 vols. Bonn: Klopp Verlag.
- IEW Pokorny, Julius. 1959. *Indogermanisches etymologisches Wörterbuch*. Bern: Francke.
- KEWA Mayrhofer, Manfred. 1956–1980. *Kurzgefasstes etymologisches Wörterbuch des Altindischen*. 4 vols. Heidelberg: Carl Winter Universitätsverlag.
- LEW Fraenkel, Ernst. 1962–1965. *Litauisches etymologisches Wörterbuch*. 2 vols. Heidelberg: Carl Winter Universitätsverlag.
- LIV Rix, Helmut, Martin Kümmel, Thomas Zehnder, Reiner Lipp, & Birgitte Schirmer. *Lexikon der Indogermanischen Verben: Die Wurzeln und ihre Primärstammbildungen*. 2nd edn. Wiesbaden: Dr. Ludwig Reichert Verlag.
- LKŽ Balčikonis, Juozas, Vytautas Vitkauskas. 1941–2002. *Lietuvių kalbos žodynas*. 20 vols. Vilnius: Mokslas, Lietuvių kalbos instituto leidykla.
- RR Būga, Kazimieras. 1958–1962. *Rinktiniai Raštai*. 4 vols. Vilnius: Valstybinė politinės ir mokslinės literatūros leidykla.
- Vaillant I–V Vaillant, André. 1950–1977. *Grammaire comparée des langues slaves*. 5 vols. Lyon: IAC & Paris: Klincksieck.
- Vasmer I–III Vasmer, Max. 1953–1958. *Russisches etymologisches Wörterbuch*. 3 vols. Heidelberg: Carl Winter Universitätsverlag.

6.2. List by author

- Abaev, Vasilij I. 1965. *Skifo-evropejskie izoglossy*. Moscow: Nauka.
- Adams, Douglas Q. 2013. *A dictionary of Tocharian B*. Amsterdam: Brill.
- Adiego Lajara, Ignacio-Javier. 2007. *The Carian language*. Leiden: Brill.
- Agee, Joshua R. 2021. Using historical glottometry to subgroup the early Germanic languages. *Journal of Germanic Linguistics* 33(4). 319–357.
- Allen, W. Sidney. 1973. $\chi\theta\acute{\omega}\nu$, ‘*RUKI*’, and related matters: A reappraisal. *Transactions of the Philological Society* 72. 98–126.
- Allentoft, Morten E., Martin Sikora, Karl-Göran Sjögren, Simon Rasmussen, Morten Rasmussen, Jesper Stenderup, Peter B. Damgaard, et al. 2015. Population

- genomics of Bronze Age Eurasia. *Nature* 522(7555). 167–172. <https://doi.org/10.1038/nature14507>.
- Ambrasas, Saulius & William Schmalstieg. 2018. The morphology of Baltic. In Jared Klein, Brian Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics* (Handbücher zur Sprach- und Kommunikationswissenschaft; Handbooks of Linguistics and Communication Science 41.3), vol. 3, 1651–1667. Berlin: De Gruyter Mouton.
- Andersen, Henning. 1968. IE *s after i, u, r, k in Baltic and Slavic. *Acta Linguistica Hafniensia* 11(2). 171–190.
- Anthony, David W. 2007. *The horse, the wheel, and language: How Bronze-Age riders from the Eurasian steppes shaped the modern world*. Princeton: Princeton University Press.
- Anthony, David W. 2009. The Sintashta genesis: The roles of climate change, warfare, and long-distance trade. In Bryan K. Hanks & Katheryn M. Linduff (eds.), *Social complexity in prehistoric Eurasia: Monuments, metals, and mobility*, 47–73. Cambridge: Cambridge University Press.
- Anthony, David W. 2016. The Samara Valley project and the evolution of pastoral economies in the Western Eurasian Steppes. In David W. Anthony, Dorcas R. Brown, Oleg D. Mochalov, Aleksandr A. Khokhlov & Pavel F. Kuznetsov (eds.), *A Bronze Age landscape in the Russian steppes: The Samara Valley project* (Monumenta Archaeologica 37), 3–36. Los Angeles, California: UCLA Cotsen Institute of Archaeology Press.
- Anthony, David W. 2023a. The Yamnaya culture and nomadic pastoralism. In Kristian Kristiansen, Guus Kroonen & Eske Willerslev (eds.), *The Indo-European puzzle revisited: Integrating archaeology, genetics, and linguistics*, 13–33. Cambridge: Cambridge University Press.
- Anthony, David W. 2023b. Ten constraints that limit the Late PIE homeland to the steppes. In David M. Goldstein, Stephanie W. Jamison & Anthony D. Yates (eds.), *Proceedings of the 33rd Annual UCLA Indo-European Conference*, 1–25. Hamburg: Buske.
- Anthony, David W. & Don Ringe. 2015. The Indo-European Homeland from Linguistic and Archaeological Perspectives. *Annual Review of Linguistics* 1(1). 199–219.
- Anttila, Raimo. 1972. *An introduction to historical and comparative linguistics*. New York: The Macmillan Company.
- Arntz, Helmut. 1933. *Sprachliche Beziehungen zwischen arisch und balto-slawisch*. Heidelberg: Carl Winters Universitätsbuchhandlung.
- Askarov, Akhmadali. 1999. The beginning of the Iron Age in Transoxiana. In Ahmad Hasan Dani & Vadim Mikhaïlovich Masson (eds.), *History of civilizations of Central Asia*, 432–449. Delhi: Motilal Banarsidass Publishers.
- Bailey, Harold W. 1979. *Dictionary of Khotan Saka*. Cambridge: Cambridge University Press.
- Bartholomae, Christian. 1904. *Altiranisches Wörterbuch*. Strassburg: Verlag von Karl J. Trübner.
- Bauhaus, Stefan H. 2019. The Proto-Indo-European suffix *-r revisited. In Alwin Kloekhorst & Tijmen Pronk (eds.), *The Precursors of Proto-Indo-European*, 15–29. Leiden: Brill.
- Beek, Lucien van. 2013. *The development of the Proto-Indo-European syllabic liquids in Greek*. Leiden University PhD dissertation.

- Beek, Lucien van. 2017. Greek βλάπτω and further evidence for a Proto-Greek voicing rule *-*ŋ*T- > *-*ŋ*D-. In Bjarne S. Sandgaard Hansen, Adam Hyllested, Anders R. Jørgensen, Guus Kroonen, Jenny H. Larsson, Benedicte Nielsen Whitehead, Thomas Olander & Tobias Mosbæk Søborg (eds.), *Usque ad radices: Indo-European studies in honour of Birgit Anette Olsen*, 55–72. Copenhagen: Museum Tusculanum Press.
- Beekes, Robert S. P. 1983. On laryngeals and pronouns. *Zeitschrift für vergleichende Sprachforschung* 96. 200–232.
- Beekes, Robert S. P. 1987. Indo-European neuters in -i-. In George Cardona & Norman Zide (eds.), *Festschrift for Henry Hoenigswald: On the occasion of his seventieth birthday*, 45–56. Tübingen: Narr.
- Beekes, Robert S. P. 1988. *A grammar of Gatha-Avestan*. Leiden: E.J. Brill.
- Beekes, Robert S. P. 1994. “Right”, “left” and “naked” in Proto-Indo-European. *Orbis* 37. 87–96.
- Beekes, Robert S. P. 2010. *Etymological dictionary of Greek* (Leiden Indo-European Etymological Dictionary Series v. 10/1-2). Leiden: Brill.
- Beekes, Robert S. P. 2011. *Comparative Indo-European linguistics: An introduction*. 2nd edn. Amsterdam/Philadelphia: John Benjamins Publishing Company.
- Bellwood, Peter. 2001. Early agriculturalist population diasporas? Farming, languages, and genes. *Annual Review of Anthropology* 30. 181–207.
- Bellwood, Peter. 2013. Human migrations and the histories of major language families. In Immanuel Ness & Peter Bellwood (eds.), *The encyclopedia of global human migration*, 87–95. Oxford: Blackwell Publishing Ltd.
- Benfey, Theodor. 1875. Die Indogermanen hatten schon vor ihrer Trennung sowohl Salz als Ackerbau. *Allgemeine Zeitung* 208. 3269–3270.
- Benveniste, Émile. 1967. Les relations lexicales slavo-iraniennes. In *To honor Roman Jakobson: essays on the occasion of his 70. birthday, 11. October 1966*, 197–202. De Gruyter.
- Bergsland, Knut & Hans Vogt. 1962. On the validity of glottochronology. *Current Anthropology* 3(2). 115–153.
- Bezenberger, Adalbert. 1890. Die indogermanischen gutturalreihen. In Adalbert Bezenberger (ed.), *Beiträge zur kunde der indogermanischen sprachen*, vol. 16, 234–260. Göttingen: Vandenhoeck & Ruprecht.
- Bezenberger, Adalbert. 1907. Studien über die Sprache des preussischen Enchiridions. *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete der Indogermanischen Sprachen* 41(1/2). 65–127.
- Bird, Norman. 1993. *The roots and non-roots of Indo-European*. Wiesbaden: Harrassowitz Verlag.
- Birwé, Robert. 1956. *Griechisch-arische Sprachbeziehungen im Verbalsystem*. Walldorf: Verlag für Orientkunde.
- Blažek, Václav. 2005. Review: Witczak, Krzysztof Tomasz. Indoeuropejskie nazwy zbóż. *Sborník prací Filozofické fakulty brněnské univerzity. A, Rada jazykovědná* 54(A53). 219–225.
- Bloomfield, Leonard. 1935. *Language*. British ed. London: George Allen & Unwin Ltd.
- Bonfante, Giuliano. 1931. I dialetti indoeuropei. *Annali del Reale Istituto Orientale di Napoli* 4. 67–186.
- Bonfante, Giuliano. 1976. *I dialetti indoeuropei* (Studi Grammatici e Linguistici 12). Brescia: Paideia.

- Bopp, Franz. 1853. *Über die Sprache der alten Preussen in ihren verwandtschaftlichen Beziehungen*. Berlin: Ferd. Dümmler's Verlagsbuchhandlung.
- Bouckaert, Remco, Philippe Lemey, Michael Dunn, Simon J. Greenhill, Alexander V. Alekseyenko, Alexei J. Drummond, Russell D. Gray, Marc A. Suchard & Quentin D. Atkinson. 2012. Mapping the origins and expansion of the Indo-European language family. *Science* 337(6097). 957–960. <https://doi.org/10.1126/science.1219669>.
- Boutkan, Dirk & Sjoerd M. Siebenga. 2005. *Old Frisian etymological dictionary* (Leiden Indo-European Etymological Dictionary Series 1). Leiden: Brill.
- Bozzone, Chiara. 2016. The origin of the Caland system and the typology of adjectives. *Indo-European Linguistics* 4(1). 15–52.
- Bradke, Peter von. 1890. *Über Methode und Ergebnisse der arischen (indogermanischen) Alterthumswissenschaft*. Giessen: J. Ricker'sche Buchhandlung.
- Brandenstein, Wilhelm. 1936. *Die erste "indogermanische" Wanderung* (Klotho. Historische Studien Zur Feudalen Und Vorfeudalen Welt 2). Wien: Verlag Gerold & Co.
- Brugmann, Karl. 1884. Zur Frage nach den Verwandtschaftsverhältnissen der indogermanischen Sprachen. *Internationale Zeitschrift für allgemeine Sprachwissenschaft* 1. 226–256.
- Brugmann, Karl. 1886. *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen, Volume 1*. Strassburg: Karl J. Trübner.
- Brugmann, Karl. 1892. *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen, Volume 2*. Strassburg: Karl J. Trübner.
- Brugmann, Karl & Berthold Delbrück. 1897. *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen*. 2nd edn. Vol. 1. 5 vols. Strassburg: Karl J. Trübner.
- Bryant, Edwin. 2001. *The quest for the origins of the Vedic culture: The Indo-Aryan migration debate*. Oxford: Oxford University Press.
- Būga, Kazimieras. 1922. *Kalba ir senovė*. Kaunas: Švietimo Ministerijos leidinys.
- Bugge, Sophus. 1890. *Etruskisch und Armenisch. Sprachvergleichende Forschungen*. Christiania: H. Aschehoug & Co.
- Burrow, Thomas. 1973. *The Sanskrit Language*. London: Faber and Faber.
- Caland, Willem. 1909. Altiranisches. *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete der Indogermanischen Sprachen* 42(2). 171–173.
- Caliebe, Amke, Almut Nebel, Cheryl Makarewicz, Michael Krawczak & Ben Krause-Kyora. 2017. Insights into early pig domestication provided by ancient DNA analysis. *Scientific Reports* 7(1). 44550. <https://doi.org/10.1038/srep44550>.
- Carpelan, Christian & Asko Parpola. 2001. Emergence, contacts and dispersal of Proto-Indo-European, Proto-Uralic and Proto-Aryan in archaeological perspective. In Christian Carpelan, Asko Parpola & Petteri Koskikallio (eds.), *Early contacts between Uralic and Indo-European: linguistic and archaeological considerations. Papers presented at an international symposium held at the Tvärminne research station of the University of Helsinki 8–10 January 1999* (Mémoires de La Société Finno-Ougrienne 242), 55–150. 2nd edn. Helsinki: Suomalais-Ugrilainen Seura.
- Čekman, Valerij N. 1974. O refleksax indoevropskix **k̑*, **g̑* v balto-slavjanskom jazykovom areale. *Balto-slavjanskije issledovanija* 116–135.
- Černyx, Evgenij N. & Sergej V. Kuz'minyx. 1987. Pamjatniki Sejmsko-Turbinskogo tipa v Evrazii. *Ėpokha bronzy lesnoj polosy SSSR* 84–105.
- Chernykh, Evgeniy N. 1992. *Ancient metallurgy in the USSR* (New Studies in Archaeology). (Trans.) Sarah Wright. Cambridge: Cambridge University Press.

- Cheung, Johnny. 2002. *Studies in the historical development of the Ossetic vocalism* (Beiträge zur Iranistik 21). Wiesbaden: Reichert.
- Cheung, Johnny. 2007. *Etymological dictionary of the Iranian verb* (Leiden Indo-European Etymological Dictionary Series 2). Leiden: Brill.
- Childe, V. Gordon. 1929. *The Danube in prehistory*. Oxford: Clarendon Press.
- Clackson, James. 1994. *The linguistic relationship between Armenian and Greek*. Oxford: Blackwell.
- Clackson, James. 2007. *Indo-European linguistics: An introduction*. Cambridge: Cambridge University Press.
- Clackson, James. 2013. The origin of the Indic languages: The Indo-European model. In Angela Marcantonio & Girish Nath Jha (eds.), *Perspectives on the origin of Indian civilization*, 259–287. New Delhi: D. K. Printworld Pvt. Ltd.
- Clackson, James. 2022. Methodology in linguistic subgrouping. In Thomas Olander (ed.), *The Indo-European language family: A phylogenetic perspective*, 18–32. Cambridge: Cambridge University Press.
- Clemente, Florian, Martina Unterländer, Olga Dolgova, Carlos Eduardo G. Amorim, Francisco Coroado-Santos, Samuel Neuenschwander, Elissavet Ganiatsou, et al. 2021. The genomic history of the Aegean palatial civilizations. *Cell* 184(10). 2565–2586.e21. <https://doi.org/10.1016/j.cell.2021.03.039>.
- Coleman, Robert. 1988. Reviewed work(s): Archaeology and language: The puzzle of Indo-European origins by Colin Renfrew. *Current Anthropology* 29(3). 437–468.
- Collins, Daniel. 2018. The phonology of Slavic. In Jared Klein, Brian Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics* (Handbücher zur Sprach- und Kommunikationswissenschaft = Handbooks of Linguistics and Communication Science 41.3), 1414–1538. Berlin: De Gruyter Mouton.
- Cowgill, Warren. 1974. More evidence for Indo-Hittite: The tense-aspect systems. In Luigi Heilmann (ed.), *Proceedings of the eleventh International Congress of Linguists, Bologna-Florence, Aug. 28-Sept. 2, 1972*, 557–570. Bologna: Società editrice il Mulino.
- Cunliffe, Barry W. 2015. *Steppe, desert, and ocean: the birth of Eurasia*. Oxford: Oxford University Press.
- Cuny, Albert. 1910. Les mots du fonds préhellénique en grec, latin, sémitique occidental. *Revue des études anciennes* 12(2). 154–164.
- Curtis, Matthew C. 2018. The dialectology of Albanian. In Jared Klein, Brian Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics* (Handbücher zur Sprach- und Kommunikationswissenschaft = Handbooks of Linguistics and Communication Science 41.3), 1800–1811. Berlin: De Gruyter Mouton.
- Damgaard, Peter de Barros, Rui Martiniano, Jack Kamm, J. Víctor Moreno-Mayar, Guus Kroonen, Michaël Peyrot, Gojko Barjamovic, et al. 2018. The first horse herders and the impact of early Bronze Age steppe expansions into Asia. *Science* 360(6396). eaar7711. <https://doi.org/10.1126/science.aar7711>.
- Danti, Michael D. 2013. The Late Bronze and Early Iron Age in Northwestern Iran. In Daniel T. Potts (ed.), *The Oxford handbook of ancient Iran*, 327–376. New York: Oxford University Press.
- Davies, Paul & Alan S. C. Ross. 1975. ‘Close-relationship’ in the Indo-European languages. *Transactions of the Philological Society* 74. 82–100.

- Delamarre, Xavier. 2003. *Dictionnaire de la langue gauloise: une approche linguistique du vieux-celtique continental* (Collection des Hespérides). 2e éd. rev. et augm. Paris: Errance.
- Delamarre, Xavier. 2006. Prasutagus. *Studia Celtica Fennica* 3. 5–9.
- Delbrück, Berthold. 1880. *Einleitung in das Sprachstudium. Ein Beitrag zur Geschichte und Methodik der vergleichenden Sprachforschung*. Leipzig: Breitkopf & Härtel.
- Demiraj, Bardhyl. 1997. *Albanische Etymologien: Untersuchungen zum albanischen Erbwortschatz* (Leiden Studies in Indo-European 7). Amsterdam: Rodopi.
- Derksen, Rick. 1996. *Metatony in Baltic* (Leiden Studies in Indo-European 6). Amsterdam: Rodopi.
- Derksen, Rick. 2001. Lith. *uostas*, Latv. *uosta* ‘port, harbour’. *Baltistica* 36(1). 37–42.
- Derksen, Rick. 2002. On the reception of Winter’s law. *Baltistica* 37(1). 5–13.
- Derksen, Rick. 2008. *Etymological dictionary of the Slavic inherited lexicon* (Leiden Indo-European Etymological Dictionary Series 4). Leiden: Brill.
- Derksen, Rick. 2015. *Etymological dictionary of the Baltic inherited lexicon* (Leiden Indo-European Etymological Dictionary Series 13). Leiden: Brill.
- Dickenmann, Ernst. 1934. *Untersuchungen über die Nominalkomposition im Russischen. Teil I: Einleitung und Material*. Leipzig: Otto Harrassowitz.
- Dragoni, Federico. 2023. Watañi lāntam. *Khotanese and Tumshuqese loanwords in Tocharian* (Beiträge zur Iranistik 50). Wiesbaden: Reichert Verlag.
- Dunkel, George E. 1982. σύν, ξύν. *Glotta* 60. 55–61.
- Dunkel, George E. 2009. Lithuanian chips from an aptotologist’s workshop. *Baltistica* 44(1). 37–57.
- Dunkel, George E. 2014. *Lexikon der indogermanischen Partikeln und Pronominalstämme* (Indogermanische Bibliothek. Zweite Reihe, Wörterbücher). 2 vols. Heidelberg: Universitätsverlag Winter.
- Durkin-Meisterernst, Desmond. 2004. *Dictionary of Manichaean texts. Vol. 3 Pt. 1: Texts from Central Asia and China Dictionary of Manichaean Middle Persian and Parthian* (Corpus Fontium Manichaeorum Subsidia). (Ed.) Nicholas Sims-Williams. Turnhout: Brepols.
- Dyen, Isidore. 1953. Reviewed work(s): Malgache et maanjan: Une comparaison linguistique by Otto Chr. Dahl. *Language* 29(4). 577–590.
- Dyen, Isidore, Joseph B. Kruskal & Paul Black. 1992. An Indo-European classification: A lexicostatistical experiment. *Transactions of the American Philosophical Society* 82(5). 1–132.
- Edgerton, Franklin. 1914. Vedic *sabhā*. *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete der Indogermanischen Sprachen* 46(1/2). 173–178.
- Efimov, Valentin A. 2011. *TheOrmuri language in past and present*. (Trans.) Joan L. G. Baart. Islamabad: Forum for Language Initiatives.
- Eichner, Heiner. 1975. Die Vorgeschichte des hethitischen Verbalsystems. In Helmut Rix (ed.), *Flexion und Wortbildung. Akten der V. Fachtagung der Indogermanischen Gesellschaft, Regensburg, 9. – 14. September 1973*, 71–103. Wiesbaden: Dr. Ludwig Reichert Verlag.
- Eichner, Heiner. 1988. *os-*, eine sidetisch-lydische Wortgleichung? *Kadmos* 27(1).
- Eichner, Heiner. 1992. Anatolian. In Jadranka Gvozdanović (ed.), *Indo-European numerals*, 29–96. Berlin : New York: De Gruyter Mouton.
- Eichner, Heiner. 2002. Lateinisch *hostia*, *hostus*, *hostīre* und die stellvertretende Tierrötung der Hethiter. In *Novalis Indogermanica. Festschrift für Günther Neumann zum 80. Geburtstag* (Grazer Vergleichende Arbeiten 17), 101–156. Graz: Leykam.

- Eidem, Jesper. 2014. The Kingdom of Šamši-Adad and its legacies. In Eva Cancik-Kirschbaum, Nicole Brisch & Jesper Eidem (eds.), *Constituent, confederate, and conquered space: The emergence of the Mitanni state*, 137–146. Boston: De Gruyter.
- Emmerick, Ronald E. 1968. *Saka grammatical studies* (London Oriental Series 20). London: Oxford University Press.
- Endzelin, J. 1923. *Lettische Grammatik*. Heidelberg: Carl Winter's Universitätsbuchhandlung.
- Endzelin, Jānis. 1944. *Altpreuussische Grammatik*. Riga: Verlag Latvju Grāmata.
- Engovatova, Asya, Irina Alborova, Kharis Mustafin, Vladimir Lunkov, Yulia Lunkova, Alexander Kanapin, Anastasia Samsonova & Maria Mednikova. 2023. Ancient DNA of the bearers of the Fatyanovo and Abashevo Cultures (concerning migrations of the Bronze Age people in the forest belt on the Russian plain). *Stratum plus. Archaeology and Cultural Anthropology* (2). 207–228. <https://doi.org/10.55086/sp232207228>.
- Epimakhov, Andrey V., Elya Zazovskaya & Irina Alaeva. 2023. Migrations and cultural evolution in the light of radiocarbon dating of Bronze Age sites in the Southern Urals. *Radiocarbon* 1–15. <https://doi.org/10.1017/RDC.2023.62>.
- Epimakhov, Andrej V. 2020. Radiouglerodnye argumenty abashevskogo proisxoždenija sintashtinskix tradicij bronzovogo veka. *Ural'skij istoričeskij vestnik* 69(4). 51–60. [https://doi.org/10.30759/1728-9718-2020-4\(69\)-51-60](https://doi.org/10.30759/1728-9718-2020-4(69)-51-60).
- Euler, Wolfram. 1979. *Indoiranisch-griechische Gemeninsamkeiten der Nominalbildung und deren indogermanische Grundlagen* (Innsbrucker Beiträge zur Sprachwissenschaft 30). Innsbruck: Institut für Sprachwissenschaft der Universität Innsbruck.
- Euler, Wolfram. 1992. Personalpronomina im Altpreußischen. Zur Frage nach ihrer Herkunft und ihrer Häufung in der dritten Person. *Linguistica Baltica* 1. 127–141.
- Falk, Harry. 1986. *Bruderschaft und Würfelspiel. Untersuchungen zur Entwicklungsgeschichte des vedischen Opfers*. Freiburg: Hedwig Falk.
- Fick, August. 1870. *Vergleichendes Wörterbuch der Indogermanischen Sprachen: Ein sprachgeschichtlicher Versuch*. 2nd edn. Vol. 1. 2 vols. Göttingen: Vandenhoeck & Ruprecht.
- Fick, August. 1873. *Die ehemalige Spracheinheit der Indogermanen Europas: Eine sprachgeschichtliche Untersuchung*. Göttingen: Vandenhoeck & Ruprecht's Verlag.
- Fischer, Helmut. 1982. Lateinisch *gravis* “schwer.” *Münchener Studien zur Sprachwissenschaft* 41. 33–34.
- Forrer, Emil. 1921. Ausbeute aus den Boghazköi-Inschriften. *Mitteilungen der Deutschen Orient-Gesellschaft* 61. 20–39.
- Fortson, Benjamin W. IV. 2010. *Indo-European language and culture: An introduction*. 2nd edn. Chichester: Wiley-Blackwell.
- Fraenkel, Ernst. 1962. *Litauisches etymologisches Wörterbuch*. Vol. 38. Heidelberg: Carl Winter Universitätsverlag. (23 March, 2021).
- François, Alexandre. 2014. Trees, waves, and linkages: Models of language diversification. In Claire Bower & Bethwyn Evans (eds.), *The Routledge handbook of historical linguistics*, 161–189. London: Routledge.
- Friis, Louise S. forthc. *Studies in Tocharian verbal morphology relevant to the cladistic position of Tocharian in Indo-European*. Leiden University PhD dissertation.

- Furnée, Edzard. 1979. *Vorgriechisches-Kartvelisches: Studien zum ostmediterranen Substrat nebst einem Versuch zu einer neuen pelasgischen Theorie*. Leuven-Louvain: Edition Peeters.
- Gaitzsch, Torsten & Johann Tischler. 2017. The homeland of the speakers of Proto-Indo-European. In Jared Klein, Brian Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics* (Handbücher zur Sprach- und Kommunikationswissenschaft = Handbooks of Linguistics and Communication Science 41.1), 85–92. Berlin: De Gruyter Mouton.
- Gamkrelidze, Thomas V. & Vjačeslav V. Ivanov. 1995. *Indo-European and the Indo-Europeans* (Trends in Linguistics. Studies and Monographs 80). (Ed.) Werner Winter. (Trans.) Johanna Nichols. Berlin: Mouton de Gruyter.
- Geisler, Hans & Johann-Mattis List. 2013. Do languages grow on trees? The tree metaphor in the history of linguistics. In Heiner Fangerau, Hans Geisler, Thorsten Halling & William Martin (eds.), *Classification and evolution in biology, linguistics and the history of science: Concepts – Methods – Visualization*, 111–124. Stuttgart: Franz Steiner Verlag.
- Gening, Vladimir F. 1979. The cemetery at Sintashta and the early Indo-Iranian peoples. *Journal of Indo-European Studies* 7. 1–29.
- Gerling, Claudia. 2015. *Prehistoric mobility and diet in the West Eurasian steppes 3500 to 300 BC: An isotopic approach*. Berlin: De Gruyter.
- Gershevitch, Ilya. 1959. *The Avestan hymn to Mithra*. Cambridge: Cambridge University Press.
- Gharib, Badr-az-Zamān. 1995. *Sogdian dictionary: Sogdian - Persian - English*. 2. print. Tehran: Farhang Publications.
- Gildea, Spike, Eugenio R. Luján & Jóhanna Barðdal. 2020. The curious case of reconstruction in syntax. In Jóhanna Barðdal, Spike Gildea & Eugenio R. Luján (eds.), *Reconstructing syntax*, 1–44. Leiden: Brill.
- Gimbutas, Marija A. 1956. *The prehistory of eastern Europe*. Cambridge, Massachusetts: Peabody Museum.
- Gimbutas, Marija A. 1963. The Indo-Europeans: Archeological problems. *American Anthropologist* 65(4). 815–836.
- Gimbutas, Marija A. 1965. *Bronze Age cultures in Central and Eastern Europe*. The Hague: Mouton & Co.
- Gleason, H. Allan. 1959. Counting and calculating for historical reconstruction. *Anthropological Linguistics* 1(2). 22–32.
- Gorbachov, Yaroslav. 2014. The origin of the Baltic inchoative in *-sta-*. *Indogermanische Forschungen* 119(1). 21–54.
- Gotō, Toshifumi. 1996. *Die “I. Präsensklasse” im Vedischen: Untersuchung der vollstufigen thematischen Wurzelpräsentia* (Österreichische Akademie der Wissenschaften Philosophisch-historische Klasse, Sitzungsberichte 489). 2. überarb. und erg. Aufl. Wien: Österr. Akad. der Wiss.
- Grassmann, Hermann. 1863a. Ueber die aspiraten und ihr gleichzeitiges vorhandensein im an- und auslaute der wurzeln. *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete des Deutschen, Griechischen und Lateinischen* 12(2). 81–110.
- Grassmann, Hermann. 1863b. Ueber das ursprüngliche vorhandensein von wurzeln, deren anlaut und auslaut eine aspirate enthielt. *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete des Deutschen, Griechischen und Lateinischen* 12(2). 110–138.

- Grassmann, Hermann. 1996. *Wörterbuch zum Rig-Veda*. 6th edn. Wiesbaden: Harrassowitz Verlag.
- Gray, Russell D. & Quentin D. Atkinson. 2003. Language-tree divergence times support the Anatolian theory of Indo-European origin. *Nature* 426(6965). 435–439. <https://doi.org/10.1038/nature02029>.
- Greenberg, Joseph H. 1957. *Essays in linguistics*. Chicago: The University of Chicago Press.
- Grigoriev, Stanislav. 2021. Andronovo problem: Studies of cultural genesis in the Eurasian Bronze Age. *Open Archaeology* 7(1). 3–36. <https://doi.org/10.1515/opar-2020-0123>.
- Grimm, Jacob. 1848. *Geschichte der deutschen Sprache*. 2 vols. Leipzig: Weidmannsche Buchhandlung.
- Grünthal, Riho, Volker Heyd, Sampsa Holopainen, Juha A. Janhunen, Olesya Khanina, Matti Miestamo, Johanna Nichols, Janne Saarikivi & Kaius Sinnemäki. 2022. Drastic demographic events triggered the Uralic spread. *Diachronica* 39(4). 490–524. <https://doi.org/10.1075/dia.20038.gru>.
- Guarino-Vignon, Perle, Nina Marchi, Julio Bendezu-Sarmiento, Evelyn Heyer & Céline Bon. 2022. Genetic continuity of Indo-Iranian speakers since the Iron Age in southern Central Asia. *Scientific Reports* 12(1). 733. <https://doi.org/10.1038/s41598-021-04144-4>.
- Güntert, Hermann. 1916. *Indogermanische Ablautprobleme. Untersuchungen über Schwa secundum, einen zweiten indogermanischen Murmevokal* (Untersuchungen Zur Indogermanischen Sprach- Und Kulturwissenschaft 6). Strassburg: Verlag von Karl J. Trübner.
- Haak, Wolfgang, Iosif Lazaridis, Nick Patterson, Nadin Rohland, Swapan Mallick, Bastien Llamas, Guido Brandt, et al. 2015. Massive migration from the steppe was a source for Indo-European languages in Europe. *Nature* 522(7555). 207–211. <https://doi.org/10.1038/nature14317>.
- Hamp, Eric P. 1972. Palaic ḫa-a-ap-na-aš ‘river’. *Münchener Studien zur Sprachwissenschaft* 30.
- Hamp, Eric P. 1990. The Pre-Indo-European languages of Northern (Central) Europe. In Thomas L. Markey & John A. C. Greppin (eds.), *When worlds collide: The Indo-Europeans and the Pre-Indo-Europeans*, 291–305. Ann Arbor, Mich.: Karoma Publishers, Inc.
- Hanks, Bryan, Alicia Ventresca Miller, Margaret Judd, Andrey Epimakhov, Dmitry Razhev & Karen Privat. 2018. Bronze Age diet and economy: New stable isotope data from the Central Eurasian steppes (2100–1700 BC). *Journal of Archaeological Science* 97. 14–25. <https://doi.org/10.1016/j.jas.2018.06.006>.
- Harðarson, Jon Axel. 2018. Germanisch *truwa-, *trewwa- und *-trewwija- und ihre urindogermanischen Grundlagen. In Olaf Hackstein & Andreas Opfermann (eds.), *Priscis Libentius et Liberius Novis. Indogermanische und sprachwissenschaftliche Studien. Festschrift für Gerhard Meiser zum 65. Geburtstag*, 229–263. Hamburg: Baar.
- Heggarty, Paul. 2006. Interdisciplinary indiscipline? Can phylogenetic methods meaningfully be applied to language data – and to dating language? In Peter Forster & Colin Renfrew (eds.), *Phylogenetic methods and the prehistory of languages*, 183–194. Cambridge: McDonald Institute for Archaeological Research.

- Heggarty, Paul. 2013. Europe and Western Asia: Indo-European linguistic prehistory. In Immanuel Ness & Peter Bellwood (eds.), *The encyclopedia of global human migration*, 157–167. Oxford: Wiley-Blackwell.
- Heggarty, Paul. 2014. Prehistory through language and archaeology. In Claire Bower & Bethwyn Evans (eds.), *The Routledge handbook of historical linguistics*, 598–626. Abingdon: Routledge.
- Heggarty, Paul. 2018. Indo-European and the ancient DNA revolution. In Guus Kroonen, James P. Mallory & Bernard Comrie (eds.), *Talking Neolithic: Proceedings of the workshop on Indo-European origins held at the Max Planck Institute for Evolutionary Anthropology, Leipzig, December 2-3, 2013* (Journal of Indo-European Monograph Series 65), 120–173. Washington, D.C.: Institute for the Study of Man.
- Heggarty, Paul, Cormac Anderson, Matthew Scarborough, Benedict King, Remco Bouckaert, Lechosław Jocz, Martin Joachim Kümmel, et al. 2023. Language trees with sampled ancestors support a hybrid model for the origin of Indo-European languages. *Science* 381(6656). eabg0818. <https://doi.org/10.1126/science.abg0818>.
- Hehn, Victor. 1870. *Kulturpflanzen und Haustiere in ihrem Übergang aus Asien nach Griechenland und Italien sowie in das übrige Europa: Historisch-linguistische Skizzen*. Berlin: Gebrüder Borntraeger.
- Hehn, Victor. 1873. *Das Salz. Eine kulturhistorische Studie*. Berlin: Gebrüder Borntraeger.
- Hehn, Victor. 1877. *Kulturpflanzen und Haustiere in ihrem Übergang aus Asien nach Griechenland und Italien sowie in das übrige Europa: Historisch-linguistische Skizzen*. 3rd edn. Berlin: Gebrüder Borntraeger.
- Hellquist, Elof. 1922. *Svensk etymologisk ordbok*. Lund: C. W. K. Gleerups förlag.
- Hermann, Eduard. 1907. Über das Rekonstruieren. *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete der Indogermanischen Sprachen* 41(1/2). 1–64.
- Heyd, Volker, Ludwig Husty & Ludwig Kreiner. 2004. *Siedlungen der Glockenbecherkultur in Süddeutschland und Mitteleuropa* (Arbeiten zur Archäologie Süddeutschlands 17). Büchenbach: Dr. Faustus.
- Hill, Eugen. 2013. Historical phonology in service of subgrouping. Two laws of final syllables in the common prehistory of Baltic and Slavonic. *Baltistica* 48(2). 161–204.
- Hirt, Herman. 1892. Die Urheimat der Indogermanen. *Indogermanische Forschungen* 1(1). 646–485.
- Hirt, Herman. 1895a. Über die mit *-m-* und *-bh-* gebildeten Kasusuffixe. *Indogermanische Forschungen* 5(1). 251–255.
- Hirt, Herman. 1895b. Die Urheimat und die Wanderungen der Indogermanen. *Geographische Zeitschrift* 1(12). 649–665.
- Hirt, Herman. 1899. Zur Lösung der gutturalfrage im Indogermanischen. In Adalbert Bezenberger & Walther Prellwitz (eds.), *Beiträge zur Kunde der indogermanischen sprachen*, vol. 24, 218–291. Göttingen: Vandenhoeck & Ruprecht.
- Hock, Hans H. 1991. *Principles of historical linguistics*. 2nd edn. Berlin: Mouton de Gruyter.
- Hock, Wolfgang, Rainer Fecht, Anna Helene Feulner, Eugen Hill & Dagmar S. Wodtko. 2019. *Altltauisches etymologisches Wörterbuch (ALEW)*. Version 2.0. Humboldt-Universität zu Berlin. <https://doi.org/10.18452/19817>.
- Hoenigswald, Henry M. 1966. Criteria for the subgrouping of languages. In *Ancient Indo-European dialects. Proceedings of the Conference on Indo-European Linguistics*

- held at the University of California, Los Angeles, April 25-27, 1963, 1–12. Berkeley: University of California Press.
- Hoffmann, Karl. 1956. Notizen zu Wackernagel-Debrunner, Altindische Grammatik II,2. *Münchener Studien zur Sprachwissenschaft* 8. 5–24.
- Hoffmann, Karl. 1967. Drei indogermanische Tiernamen in einem Avesta-Fragment. *Münchener Studien zur Sprachwissenschaft* 22. 29–38.
- Hoffmann, Karl. 1970. Das Kategoriensystem des indogermanischen Verbums. *Münchener Studien zur Sprachwissenschaft* 28. 19–41.
- Hoffmann, Karl. 1974. Ved. *dhánuṣ-* und *páruṣ-*. *Die Sprache* 20. 15–25.
- Hoffmann, Karl & Johanna Narten. 1989. *Der Sasanidische Archetypus. Untersuchungen zu Schreibung und Lautgestalt des Avestischen*. Wiesbaden: Dr. Ludwig Reichert Verlag.
- Holm, Hans J. 2003. The proportionality trap. Or: what is wrong with lexicostatistical subgrouping? *Indogermanische Forschungen* 108. 38–46.
- Holopainen, Sampsa. 2019. *Indo-Iranian borrowings in Uralic: Critical overview of the sound substitutions and distribution criterion*. Helsinki: PhD dissertation.
- Holst, Jan H. 2009. *Armenische Studien*. Wiesbaden: Harrassowitz Verlag.
- Holthausen, Ferdinand. 1934. *Altenglisches etymologisches Wörterbuch*. 2nd edn. Heidelberg: Carl Winter Universitätsverlag.
- Hrozný, Friedrich. 1915. Die Lösung des hethitischen Problems. Ein vorläufiger Bericht. *Mitteilungen der Deutschen Orient-Gesellschaft* 56. 17–50.
- Hübschmann, Heinrich. 1877. Ueber die stellung des armenischen im kreise der indogermanischen sprachen. *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete der Indogermanischen Sprachen* 23(1). 5–49.
- Hübschmann, Heinrich. 1897. *Armenische Grammatik*. Leipzig: Druck und Verlag von Breitkopf & Härtel.
- Huld, Martin E. 1996. Meillet's Northwest Indo-European revisited. In Karlene Jones-Bley & Martin E. Huld (eds.), *The Indo-Europeanization of Northern Europe* (Journal of Indo-European Monograph Series 17), 109–125. Washington, D.C.: Institute for the Study of Man.
- Huld, Martin E. 2002. An Indo-European term for 'harvested grain'. In Karlene Jones-Bley, Martin E. Huld, Angela Della Volpe & Miriam Robbins Dexter (eds.), *Proceedings of the fourteenth annual UCLA Indo-European conference. Los Angeles. November 8-9, 2002* (Journal of Indo-European Monograph Series 47), 162–172. Washington, D.C.: Institute for the Study of Man.
- Humbach, Helmut. 1973. Neue chwaresmologische Arbeiten. *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 123(1). 83–97.
- Hüttel, Hans-Georg. 1994. Zur archäologischen Evidenz der Pferdenutzung in der Kupfer und Bronzezeit. In Bernhard Hänsel & Stefan Zimmer (eds.), *Die Indogermanen und das Pferd. Akten des Internationalen interdisziplinären Kolloquiums Freie Universität Berlin, 1.–3. Juli 1992*, 197–215. Budapest: Archaeolingua.
- Hyllested, Adam & Brian D. Joseph. 2022. Albanian. In Thomas Olander (ed.), *The Indo-European language family: A phylogenetic perspective*, 223–245. Cambridge: Cambridge University Press.
- Illich-Svitych, Vladislav M. 1979. *Nominal accentuation in Baltic and Slavic*. (Trans.) Richard L. Leed & Ronald F. Feldstein. Cambridge, Massachusetts: The MIT Press.

- Insler, Stanley. 1999. Vedic *dr̥śád-*. In Heiner Eichner, Hans Christian Luschützky & Velizar Sadovski (eds.), *Compositiones indogermanicae in memoriam Jochem Schindler*, 163–164. Praha: Enigma Corp.
- Jakob, Anthony. 2023a. *A history of East Baltic through language contact*. Leiden University PhD dissertation.
- Jakob, Anthony. 2023b, February 17. *A ruki mistake? From aporia to apriorism* [Paper presentation]. In Comparative Indo-European linguistics seminars. Leiden University.
- Jamison, Stephanie W. 1983. *Function and form in the -áya-formations of the Rig Veda and Atharva Veda*. Göttingen: Vandenhoeck & Ruprecht.
- Jamison, Stephanie W. 1993. Thornless paths and others: Vedic *anṛkṣará-* / Greek *φθειρώ*. In Gerhard Meiser, Jadwiga Bendahman, Jon Axel Harðarson & Christiane Schaefer (eds.), *Indogermanica et Italica. Festschrift für Helmut Rix zum 65. Geburtstag* (Innsbrucker Beiträge zur Sprachwissenschaft 72), 237–251. Innsbruck: Institut für Sprachwissenschaft der Universität Innsbruck.
- Jamison, Stephanie W. & Joel P. Brereton. 2014. *The Rigveda: the earliest religious poetry of India* (South Asia Research). 3 vols. New York: Oxford University Press.
- Judd, Margaret A., Jessica L. Walker, Alicia Ventresca Miller, Dmitry Razhev, Andrey V. Epimakhov & Bryan K. Hanks. 2018. Life in the fast lane: Settled pastoralism in the Central Eurasian Steppe during the Middle Bronze Age. *American Journal of Human Biology* 30(4). e23129. <https://doi.org/10.1002/ajhb.23129>.
- Jügel, Thomas. 2013. The verbal particle *BE* in Middle Persian. *Münchener Studien zur Sprachwissenschaft* 67(1). 29–56.
- Kalima, Jalo. 1940. Slav. **sębrъ*. *Zeitschrift für Slavische Philologie* 17(2). 342–350.
- Kassian, Alexei S., Mikhail Zhivlov, George Starostin, Artem A. Trofimov, Petr A. Kocharov, Anna Kuritsyna & Mikhail N. Saenko. 2021. Rapid radiation of the inner Indo-European languages: an advanced approach to Indo-European lexicostatistics. *Linguistics* 59(4). 949–979. <https://doi.org/10.1515/ling-2020-0060>.
- Kellens, Jean. 1989. Avestique. In Rüdiger Schmitt (ed.), *Compendium linguarum iranicarum*, 32–55. Wiesbaden: Dr. Ludwig Reichert Verlag.
- Kellens, Jean. 1995. *Liste du verbe avestique*. Wiesbaden: Dr. Ludwig Reichert Verlag.
- Kern, Heinrich. 1858. Ueber die Italer. *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete des Deutschen, Griechischen und Lateinischen* 7(4). 272–274.
- Kimball, Sara E. 1994. Loss and retention of voiced velars in Luvian: another look. *Indogermanische Forschungen* 99. 75–85.
- Kimball, Sara E. 1999. *Hittite historical phonology* (Innsbrucker Beiträge zur Sprachwissenschaft 95). Innsbruck: Universität Innsbruck. Institut für Sprachwissenschaft.
- Klein, Jared S. 1977. The Indo-Iranian prehistory of the Sanskrit *asáu/amúm* pronoun. *Journal of Indo-European Studies* 5. 161–176.
- Klingenschmitt, Gert. 1978. Der Beitrag der Pahlavi-Literatur zur Interpretation des Avesta. *Münchener Studien zur Sprachwissenschaft* 37. 93–107.
- Klingenschmitt, Gert. 1982. *Das altarmenische Verbum*. Wiesbaden: L. Reichert.
- Klingenschmitt, Gert. 1994. Die Verwandtschaftsverhältnisse der indogermanischen Sprachen. In Jens Elmegård Rasmussen (ed.), *In honorem Holger Pedersen. Kolloquium der Indogermanischen Gesellschaft vom 25. bis 28. März 1993 in Kopenhagen*, 235–251. Wiesbaden: Dr. Ludwig Reichert Verlag.

- Kloekhorst, Alwin. 2008. *Etymological dictionary of the Hittite inherited lexicon* (Leiden Indo-European Etymological Dictionary Series 5). Leiden: Brill.
- Kloekhorst, Alwin. in prep. The development of the PIE stops in Albanian. In Alwin Kloekhorst & Tijmen Pronk (eds.), *The Proto-Indo-European stop system*.
- Kloekhorst, Alwin & Alexander M. Lubotsky. 2014. Hittite *nai-*, *nē-*, Sanskrit *nī-*, and the PIE verbal root **(s)neh₁-*. In H. Craig Melchert, Elisabeth Rieken & Thomas Steer (eds.), *Munus amicitiae. Norbert Oettinger a collegis et amicis dicatum*, 126–137. Ann Arbor: Beech Stave Press.
- Kloekhorst, Alwin & Tijmen Pronk. 2019. Introduction: Reconstructing Proto-Indo-Anatolian and Proto-Indo-Uralic. In Alwin Kloekhorst & Tijmen Pronk (eds.), *The Precursors of Proto-Indo-European*, 1–14. Leiden: Brill.
- Knobloch, Johann. 1980. Ergologische Etymologien zum Wortschatz des indogermanischen Hausbaus. *Sprachwissenschaft* 5. 172–200.
- Korn, Agnes. 2010. Parthian ž. *Bulletin of the School of Oriental and African Studies* 73(3). 415–436.
- Kortlandt, Frederik. 1975a. A note on the Armenian palatalization. *Zeitschrift für vergleichende Sprachforschung* 89(1). 43–45.
- Kortlandt, Frederik. 1975b. *Slavic accentuation: A study in relative chronology*. Lisse: The Peter De Ridder Press.
- Kortlandt, Frederik. 1978a. On the history of the genitive plural in Slavic, Baltic, Germanic, and Indo-European. *Lingua* 45. 281–300.
- Kortlandt, Frederik. 1978b. I.-E. palatovelars before resonants in Balto-Slavic. In Jacek Fisiak (ed.), *Recent Developments in Historical Phonology*, 237–244. De Gruyter Mouton. (23 March, 2021).
- Kortlandt, Frederik. 1979. Three problems of Balto-Slavic phonology. *Zbornik za Filologiju i Lingvistiku* 22(2). 57–63.
- Kortlandt, Frederik. 1980. Albanian and Armenian. *Zeitschrift für vergleichende Sprachforschung* 94. 243–251.
- Kortlandt, Frederik. 1985. Long vowels in Balto-Slavic. *Baltistica* 21(2). 112–124.
- Kortlandt, Frederik. 1987. PIE. **s* in Albanian. In A. A. Barentsen, B. M. Groen & R. Sprenger (eds.), *Dutch studies in South Slavic and Balkan linguistics* (Studies in Slavic and General Linguistics 10), 219–226. Amsterdam: Rodopi.
- Kortlandt, Frederik. 1988. Remarks on Winter's law. In *Dutch contributions to the Tenth International Congress of Slavists, Sofia* (Studies in Slavic and General Linguistics 11), 387–396. Amsterdam: Rodopi.
- Kortlandt, Frederik. 1992. The Aeolic optative. In Robert Beekes, Alexander Lubotsky & Jos Weitenberg (eds.), *Rekonstruktion und relative Chronologie. Akten der VIII. Fachtagung der Indogermanischen Gesellschaft. Leiden, 31. August – 4. September 1987* (Innsbrucker Beiträge zur Sprachwissenschaft 65), 235–239. Innsbruck: Institut für Sprachwissenschaft der Universität Innsbruck.
- Kortlandt, Frederik. 2000. Initial *a-* and *e-* in Old Prussian. *Linguistica Baltica* 8. 125–127.
- Kortlandt, Frederik. 2004. Accent and Ablaut in the Vedic Verb. *Indo-Iranian Journal* 47(1). 7–15.
- Kortlandt, Frederik. 2007. The development of the Indo-European syllabic resonants in Balto-Slavic. *Baltistica* 42(1). 7–12.
- Kortlandt, Frederik. 2016. Balto-Slavic and Indo-Iranian. *Baltistica* 51(2). 355–364.
- Koryakova, Ludmila & Andrej V. Epimakhov. 2007. *The Urals and Western Siberia in the Bronze and Iron Ages*. Cambridge: Cambridge University Press. (5 December, 2022).

- Kossinna, Gustaf. 1911. *Die Herkunft der Germanen*. Würzburg: Verlag von Curt Kabitzsch.
- Kotwal, Firoze M. & Philip G. Kreyenbroek. 2009. *The Hērbedestān and Nērangestān. Volume IV: Nērangestān, Fragard 3* (Studia Iranica 38). Paris: Association pour l'avancement des études iraniennes.
- Krell, Kathrin S. 1998. Gimbutas' Kurgan–PIE homeland hypothesis: a linguistic critique. In Roger Blench & Matthew Spriggs (eds.), *Archaeology and language II: Correlating archaeological and linguistic hypotheses*, 267–282. London: Routledge.
- Kretschmer, Paul. 1896. *Einleitung in die Geschichte der griechischen Sprache*. Göttingen: Vandenhoeck & Ruprecht.
- Kristiansen, Kristian. 2014. Towards a new paradigm? The third science revolution and its possible consequences in archaeology. *Current Swedish Archaeology* 22(1). 11–34.
- Kroeber, Alfred L. & C. Douglas Chrétien. 1937. Quantitative classification of Indo-European languages. *Language* 13(2). 83–103.
- Kroonen, Guus. 2006. Gemination and allomorphy in the Proto-Germanic *mn*-stems: Bottom and rime. *Amsterdamer Beiträge zur älteren Germanistik* 61. 17–25.
- Kroonen, Guus. 2012. Non-Indo-European root nouns in Germanic: evidence in support of the Agricultural Substrate Hypothesis. In Riho Grünthal & Petri Kallio (eds.), *A linguistic map of prehistoric Northern Europe* (Suomalais-Ugrilaisen Seuran Toimituksia = Mémoires de La Société Finno-Ougrienne 266), 239–260. Helsinki: Société Finno-Ougrienne.
- Kroonen, Guus. 2013. *Etymological dictionary of Proto-Germanic* (Leiden Indo-European Etymological Dictionary Series 11). Leiden: Brill.
- Kroonen, Guus & Bjarne Simmelkjær Sandgaard Hansen. 2022. Germanic. In Thomas Olander (ed.), *The Indo-European language family: A phylogenetic perspective*, 152–172. Cambridge: Cambridge University Press.
- Kroonen, Guus, Anthony Jakob, Axel I. Palmér, Paulus van Sluis & Andrew Wigman. 2022. Indo-European cereal terminology suggests a Northwest Pontic homeland for the core Indo-European languages. (Ed.) Søren Wichmann. *PLOS ONE* 17(10). e0275744. <https://doi.org/10.1371/journal.pone.0275744>.
- Kroonen, Guus & Kristian Kristiansen. 2023. New directions in archaeogenetics and archaeolinguistics: Recapitulation and outlook. In Kristian Kristiansen, Guus Kroonen & Eske Willerslev (eds.), *The Indo-European puzzle revisited: Integrating archaeology, genetics, and linguistics*, 329–337. Cambridge: Cambridge University Press.
- Kroonen, Guus, Thomas Olander, Mikkel Nørtoft, Rasmus G. Bjørn, Adam Hyllested, Benedicte Nielsen Whitehead, Birgit A. Olsen, Simon Poulsen & Tobias Mosbæk Søborg. 2023. Archaeolinguistic anachronisms in the Indo-European phylogeny of Heggarty et al. 2023. *Science*.
- Kuhn, Adalbert. 1845. *Zur ältesten Geschichte der indogermanischen Völker*. Berlin: Nauck.
- Kuhn, Adalbert. 1850. Zur ältesten Geschichte der indogermanischen Völker. *Indische Studien* 1. 321–363.
- Kuiper, F. B. J. 1987. Rigvedic *súar* and *tvám*. *Indo-Iranian Journal* 30(1). 1–8.
- Kulikov, Leonid I. 2012. *The Vedic -ya-presents: passives and intransitivity in Old Indo-Aryan* (Leiden Studies in Indo-European 19). Amsterdam: Rodopi.

- Kümmel, Martin J. 2000. *Das Perfekt im Indoiranischen: eine Untersuchung der Form und Funktion einer ererbten Kategorie des Verbums und ihrer Weiterentwicklung in den altindoiranischen Sprachen*. Wiesbaden: Reichert.
- Kümmel, Martin J. 2004. Das Wort für ‘Biber’ und einige Probleme der altgermanischen Phonologie. In Matthias Fritz & Ilse Wischer (eds.), *Historisch-Vergleichende Sprachwissenschaft und germanische Sprachen. Akten der 4. Neulandtagung der Historisch-Vergleichenden Sprachwissenschaft in Potsdam 2001*, 105–117. Innsbruck: Institut für Sprachen und Literaturen der Universität Innsbruck.
- Kümmel, Martin J. 2007. *Konsonantenwandel: Bausteine zu einer Typologie des Lautwandels und ihre Konsequenzen für die vergleichende Rekonstruktion*. Wiesbaden: Reichert.
- Kümmel, Martin J. 2011–2024. Addenda und Corrigenda zu LIV². <https://www.gw.uni-jena.de/phifakmedia/fakultaet/einrichtungen/institute/institut-fuer-orientalistik/indogermanistik/dateien/mitarbeiter/martin-kuemmel/publikationen/kuemmel-liv2-add.pdf>.
- Kümmel, Martin J. 2012a. Lautgeschichte und Etymologie: Jungavestisch *mas-* ‘groß’. In *Iranische und indogermanische Onomastik und Sprachwissenschaft. Symposium in memoriam Manfred Mayrhofer (1926-2011)*, Wien, 10.-12. Mai. Vienna: Unpublished.
- Kümmel, Martin J. 2012b. The Iranian reflexes of Proto-Iranian **ns*. *Orientalia Suecana* 61. 138–145.
- Kümmel, Martin J. 2017. Agricultural terms in Indo-Iranian. In Martine Robbeets & Alexander Savelyev (eds.), *Language dispersal beyond farming*, 275–290. Amsterdam; Philadelphia: Benjamins.
- Kümmel, Martin J. 2018. The survival of laryngeals in Iranian. In Lucien van Beek, Alwin Kloekhorst, Guus Kroonen, Michaël Peyrot & Tijmen Pronk (eds.), *Farnah: Indo-Iranian and Indo-European studies in honor of Sasha Lubotsky*, 162–172. Ann Arbor: Beech Stave Press.
- Kümmel, Martin J. 2019, May 9. *Early Indo-Iranic loans in Uralic: Sounds and strata* [Paper presentation]. In *Contacts: Archaeology, genetics, languages. Joining forces to shed light on early contacts (4000 BC – 1000 AD) between Indo-European and Uralic speakers*. University of Helsinki.
- Kümmel, Martin J. 2020. Voiceless high vowels and syncope in older Indo-European. *Italian Journal of Linguistics* 32(1). 175–190.
- Kümmel, Martin J. 2021. Zum Verhältnis von avestisch *nāfō* und *nabā-* ‘Nabel’. In Matteo Tarsi (ed.), *Studies in general and historical linguistics offered to Jón Axel Harðarson on the occasion of his 65th birthday*, 191–202. Innsbruck: Institut für Sprachwissenschaft der Universität Innsbruck.
- Kümmel, Martin J. 2022. Indo-Iranian. In Thomas Olander (ed.), *The Indo-European language family: A phylogenetic perspective*, 246–268. Cambridge: Cambridge University Press.
- Kuryłowicz, Jerzy. 1935. *Études indoeuropéennes I* (Prace Komisji Językowej 21). Kraków: Polska Akademia Umiejętności.
- Kuryłowicz, Jerzy. 1945. La nature des procès dits «analogiques». *Acta Linguistica* 5(1). 15–37.
- Kuryłowicz, Jerzy. 1971. Phonologisches zum indogermanischen Gutturalproblem. In Robert Schmitt-Brandt (ed.), *Donum Indogermanicum. Festgabe für Anton Scherer zum 70. Geburtstag*, 33–38. Heidelberg: Carl Winter Universitätsverlag.
- Kuz'mina, Elena E. 2007. *The origin of the Indo-Iranians*. Leiden: Brill.

- Kuz'mina, Ol'ga V. 2021. The Abashevo Culture. *Vestnik of Saint Petersburg University. History* 66(4). 1206–1229. <https://doi.org/10.21638/11701/spbu02.2021.411>.
- Kuznetsov, Pavel F. 2006. The Emergence of Bronze Age chariots in Eastern Europe. *Antiquity* 80. 638–645.
- Kuznetsov, Pavel F. & Oleg D. Mochalov. 2016. The Samara Valley in the Bronze Age: A review of the archaeological discoveries. In David W. Anthony, Dorcas R. Brown, Oleg D. Mochalov, Aleksandr A. Khokhlov & Pavel F. Kuznetsov (eds.), *A Bronze Age landscape in the Russian steppes: The Samara Valley project* (Monumenta Archaeologica 37), 71–90. Los Angeles, California: UCLA Cotsen Institute of Archaeology Press.
- Langston, Keith. 2018. The morphology of Slavic. In Jared Klein, Brian Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics* (Handbücher zur Sprach- und Kommunikationswissenschaft = Handbooks of Linguistics and Communication Science 41.3), 1538–1557. Berlin: De Gruyter Mouton.
- Larsson, Jenny H. 2007. The master of the house – Greek οἶκος and related issues. In Coulter George, Matthew McCullagh, Benedicte Nielsen, Antonia Ruppel & Olga Tribulato (eds.), *Greek and Latin from an Indo-European perspective* (Cambridge Classical Journal. Supplementary Volume 32), 101–106. Cambridge: Cambridge Philological Society.
- Latham, Robert G. 1862. *Elements of comparative philology*. London: Walton and Maberly.
- Lazaridis, Iosif, Songül Alpaslan-Roodenberg, Ayşe Acar, Ayşen Açikkol, Anagnostis Agelarakis, Levon Aghikyan, Uğur Akyüz, et al. 2022. The genetic history of the Southern Arc: A bridge between West Asia and Europe. *Science* 377(6609). <https://doi.org/10.1126/science.abm4247>.
- Lehmann, Winfred P. 1986. *A Gothic etymological dictionary*. Leiden: E.J. Brill.
- Lehrman, Alexander. 1996. Indo-Hittite revisited. *Indogermanische Forschungen* 101. 73–88.
- Leskien, August. 1876. *Die Declination im Slavisch-Litauischen und Germanischen*. Leipzig: S. Hirzel.
- Librado, Pablo, Naveed Khan, Antoine Fages, Mariya A. Kusliy, Tomasz Suchan, Laure Tonasso-Calvière, Stéphanie Schiavinato, et al. 2021. The origins and spread of domestic horses from the Western Eurasian steppes. *Nature* 598(7882). 634–640. <https://doi.org/10.1038/s41586-021-04018-9>.
- Lidén, Evald. 1933. Zur indogermanischen Terminologie der Milchwirtschaft. *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete der Indogermanischen Sprachen* 61(1). 1–13.
- Lindner, Stephan. 2020. Chariots in the Eurasian Steppe: a Bayesian approach to the emergence of horse-drawn transport in the early second millennium BC. *Antiquity* 94(374). 361–380. <https://doi.org/10.15184/aqy.2020.37>.
- Lipp, Reiner. 2009. *Die indogermanischen und einzelsprachlichen Palatale im Indoiranischen*. Vol. 1. 2 vols. Heidelberg: Universitätsverlag Winter.
- Longobardi, Giuseppe & Cristina Guardiano. 2009. Evidence for syntax as a signal of historical relatedness. *Lingua* 119(11). 1679–1706.
- Longobardi, Giuseppe, Cristina Guardiano, Giuseppina Silvestri, Alessio Boattini & Andrea Ceolin. 2013. Toward a syntactic phylogeny of modern Indo-European languages. *Journal of Historical Linguistics* 3(1). 122–152.

- Lottner, Carl. 1858a. Ueber die Stellung der Italer innerhalb des indoeuropäischen Stammes. *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete des Deutschen, Griechischen und Lateinischen* 7(1). 18–49.
- Lottner, Carl. 1858b. Ueber die Stellung der Italer innerhalb des indoeuropäischen Stammes (Schluss). *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete des Deutschen, Griechischen und Lateinischen* 7(3). 161–193.
- Lubotsky, Alexander. 1981. Gr. *pégnumi* : Skt. *pajrá-* and loss of laryngeals before mediae in Indo-Iranian. *Münchener Studien zur Sprachwissenschaft* 40. 133–138.
- Lubotsky, Alexander. 1985. The PIE word for ‘dry’. *Historische Sprachforschung* 98. 1–10.
- Lubotsky, Alexander. 1988a. The Old Phrygian Areyastis-inscription. *Kadmos* 27(1). 9–26.
- Lubotsky, Alexander. 1988b. *The system of nominal accentuation in Sanskrit and proto-Indo-European* (Memoirs of the Kern Institut 4). Leiden: E.J. Brill.
- Lubotsky, Alexander. 1989. Against a Proto-Indo-European phoneme **a*. In Theo Vennemann (ed.), *The new sound of Indo-European*, 53–66. Walter de Gruyter & Co.
- Lubotsky, Alexander. 1994. Avestan *θβōrəstar-* and the Indo-European root *√turk-*. *Die Sprache* 36(1). 94–102.
- Lubotsky, Alexander. 1995. Reflexes of intervocalic laryngeals in Sanskrit. In Wojciech Smoczyński (ed.), *Kuryłowicz memorial volume. Part one.*, 213–233. Cracow: Universitas.
- Lubotsky, Alexander. 1997. The Indo-Iranian reflexes of PIE **CRHUV*. In Alexander Lubotsky (ed.), *Sound law and analogy. Papers in honor of Robert S.P. Beekes on the occasion of his 60th birthday* (Leiden Studies in Indo-European 9), 139–154. Amsterdam: Rodopi.
- Lubotsky, Alexander. 2001a. Reflexes of Proto-Indo-European **sk* in Indo-Iranian. *Incontri linguistici* 24. 25–57.
- Lubotsky, Alexander. 2001b. The Indo-Iranian substratum. In Christian Carpelan, Asko Parpola & Petteri Koskikallio (eds.), *Early contacts between Uralic and Indo-European: Linguistic and archaeological considerations. Papers presented at an international symposium held at the Tvärminne Research Station of the University of Helsinki 8-10 January 1999* (Mémoires de La Société Finno-Ougrienne 242), 301–317. Helsinki: Suomalais-Ugrilainen Seura.
- Lubotsky, Alexander. 2006. Indo-European ‘heel’. In R. Bombi, G. Cifoletti, F. Fusco, L. Innocente & V. Orioles (eds.), *Studi linguistici in onore di Roberto Gusmani*, 1005–1010. Alessandria: Edizioni dell’Orso.
- Lubotsky, Alexander. 2011. The origin of Sanskrit roots of the type *sīv-* ‘to sew’, *dīv-* ‘to play dice’, with an appendix of Vedic *i*-perfects. In Stephanie W. Jamison, H. Craig Melchert & Brent Vine (eds.), *Proceedings of the 22nd annual UCLA Indo-European conference*, 105–126. Bremen: Hempen.
- Lubotsky, Alexander. 2018. The phonology of Proto-Indo-Iranian. In Jared Klein, Brian Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics* (Handbücher zur Sprach- und Kommunikationswissenschaft = Handbooks of Linguistics and Communication Science 41.3), 1875–1888. Berlin: De Gruyter Mouton.
- Lubotsky, Alexander. 2021. Indo-Iranian **mastṛg^han-* / **mastṛj^han-* ‘brain, skull’ and its etymology. *Iran and the Caucasus* 25. 66–73.
- Lubotsky, Alexander. 2023. Indo-European and Indo-Iranian wagon terminology and the date of the Indo-Iranian split. In Kristian Kristiansen, Guus Kroonen & Eske

- Willerslev (eds.), *The Indo-European puzzle revisited: Integrating archaeology, genetics, and linguistics*, 257–262. Cambridge: Cambridge University Press.
- Lyonnet, Bertille & Nadezhda A. Dubova. 2021. Questioning the Oxus civilization or Bactria-Margiana archaeological culture (BMAC): An overview. In Bertille Lyonnet & Nadezhda A. Dubova (eds.), *The world of the Oxus civilization*, 7–65. London: Routledge.
- Macak, Martin. 2017. The phonology of Classical Armenian. In Jared Klein, Brian Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics* (Handbücher zur Sprach- und Kommunikationswissenschaft = Handbooks of Linguistics and Communication Science 41.2), 1037–1079. Berlin: Mouton de Gruyter.
- MacKenzie, D. Neil. 1986. *A concise Pahlavi dictionary*. London: Oxford University Press.
- Malandra, William W. 1991. Chariot. In *Encyclopedia Iranica*, vol. V, 377–380. <https://iranicaonline.org/articles/chariot-av>. (30 November, 2022).
- Mallory, Fintan. 2021. The case against linguistic palaeontology. *Topoi* 40(1). 273–284.
- Mallory, James P. 1989. *In search of the Indo-Europeans: language, archaeology and myth*. London: Thames & Hudson.
- Mallory, James P. 1994. The Indo-European homeland: An Asian perspective. *Bulletin of the Deccan College Post-Graduate and Research Institute* 54/55. 237–254.
- Mallory, James P. 2013. Twenty-first century clouds over Indo-European homelands. *Journal of Language Relationship* 9. 145–154.
- Mallory, James P. 2019. Proto-Indo-European, Proto-Uralic and Nostratic: A brief excursus into the comparative study of proto-languages. In Birgit A. Olsen, Thomas Olander & Kristian Kristiansen (eds.), *Tracing the Indo-Europeans: New evidence from archaeology and historical linguistics*, 35–58. Oxford: Oxbow Books.
- Mallory, James P. & Douglas Q. Adams (eds.). 1997. *Encyclopedia of Indo-European culture*. London: Fitzroy Dearborn.
- Malzahn, Melanie. 2010. *The Tocharian verbal system*. Leiden: Brill.
- Mańczak, Witold. 1980. The position of Germanic within the Indo-European languages. *Folia Linguistica* 1(1). 117–123.
- Marchenko, Z. V., S. V. Svyatko, V. I. Molodin, A. E. Grishin & M. P. Rykun. 2017. Radiocarbon chronology of complexes with Seima-Turbino type objects (Bronze Age) in Southwestern Siberia. *Radiocarbon* 59(5). 1381–1397. <https://doi.org/10.1017/RDC.2017.24>.
- Mariotti Lippi, Marta, Bruno Foggi, Biancamaria Aranguren, Annamaria Ronchitelli & Anna Revedin. 2015. Multistep food plant processing at Grotta Paglicci (Southern Italy) around 32,600 cal B.P. *Proceedings of the National Academy of Sciences* 112(39). 12075–12080. <https://doi.org/10.1073/pnas.1505213112>.
- Martinet, André. 1970. *Économie des changements phonétiques*. 3rd edn. Berne: A. Francke.
- Martínez, Javier. 1999. Zu einigen awestischen Wörtern mit ž. *Indogermanische Forschungen* 104. 120–131.
- Martirosyan, Hrach. 2010. *Etymological dictionary of the Armenian inherited lexicon*. Brill.
- Martirosyan, Hrach. 2013. The place of Armenian in the Indo-European language family: the relationship with Greek and Indo-Iranian. *Journal of Language Relationship* 10. 85–137.
- Matasović, Ranko. 2008. *Poredbenopovijesna gramatika hrvatskoga jezika*. Zagreb: Matica Hrvatska.

- Matasović, Ranko. 2009. *Etymological dictionary of Proto-Celtic* (Leiden Indo-European Etymological Dictionary Series 9). Leiden: Brill.
- Matasović, Ranko. 2014. *Slavic nominal word-formation: Proto-Indo-European origins and historical development* (Empirie und Theorie der Sprachwissenschaft 3). Heidelberg: Winter.
- Mathieson, Iain, Songül Alpaslan-Roodenberg, Cosimo Posth, Anna Szécsényi-Nagy, Nadin Rohland, Swapan Mallick, Iñigo Olalde, et al. 2018. The genomic history of southeastern Europe. *Nature* 555(7695). 197–203. <https://doi.org/10.1038/nature25778>.
- Mathieson, Iain, Iosif Lazaridis, Nadin Rohland, Swapan Mallick, Nick Patterson, Songül Alpaslan Roodenberg, Eadaoin Harney, et al. 2015. Genome-wide patterns of selection in 230 ancient Eurasians. *Nature* 528(7583). 499–503. <https://doi.org/10.1038/nature16152>.
- Matzinger, Joachim. 2018. The lexicon of Albanian. In Jared Klein, Brian Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics* (Handbücher zur Sprach- und Kommunikationswissenschaft; Handbooks of Linguistics and Communication Science 41.3), 1788–1800. Berlin: De Gruyter Mouton.
- Mayrhofer, Manfred. 1961. Der heutige Forschungsstand zu den arischen Sprachresten in Vorderasien. *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 111(2). 451–458.
- Maziulis, Vytautas. 1994. Albertas Rosinas. Baltų kalbų įvardžiai. *Baltistica* 27(2). 93–96.
- Maziulis, Vytautas. 2012. Prūsų kalbos etimologijos žodynas. Database. *Prūsų kalbos paveldo duomenų bazė*. prusistika.flf.vu.lt.
- Meid, Wolfgang. 1975. Probleme der räumlichen und zeitlichen Gliederung des Indogermanischen. In Helmut Rix (ed.), *Flexion und Wortbildung. Akten der V. Fachtagung der Indogermanischen Gesellschaft Regensburg, 9. – 14. September 1973*. Wiesbaden: Dr. Ludwig Reichert Verlag.
- Meid, Wolfgang. 1994. Die Terminologie von Pferd und Wagen. In Bernhard Hänsel & Stefan Zimmer (eds.), *Die Indogermanen und das Pferd. Akten des Internationalen interdisziplinären Kolloquiums Freie Universität Berlin, 1.–3. Juli 1992*, 53–65. Budapest: Archaeolingua.
- Meillet, Antoine. 1894. De quelques difficultés de la théorie des gutturaux indo-européennes. *Mémoires de la Société de Linguistique de Paris* 8. 277–304.
- Meillet, Antoine. 1902–1905. *Études sur l'étymologie et le vocabulaire du vieux slave*. 1st edn. 2 vols. Paris: Bouillon.
- Meillet, Antoine. 1908. *Les dialectes indo-européens* (Collection linguistique publiée par la Société de linguistique de Paris 1). Paris: H. Champion.
- Meillet, Antoine. 1908–1909. De quelques emprunts probables en grec et en latin. *Mémoires de la Société de Linguistique de Paris* 15. 161–164.
- Meillet, Antoine. 1926. Le vocabulaire slave et le vocabulaire indo-iranien. *Revue des études slaves* 6(3–4). 165–174.
- Meillet, Antoine. 1934. *Introduction à l'étude comparative des langues indoeuropéennes*. 7th edn. Paris: Librairie Hachette.
- Melchert, H. Craig. 1987. PIE velars in Luvian. In Calvert Watkins (ed.), *Studies in Memory of Warren Cowgill (1929-1985)*, 182–204. Berlin: Walter De Gruyter. (30 August, 2023).
- Melchert, H. Craig. 1989. New Luvo-Lycian isoglosses. *Historische Sprachforschung* 102(1). 23–45.

- Melchert, H. Craig. 1994. *Anatolian historical phonology* (Leiden Studies in Indo-European 3). Amsterdam: Rodopi.
- Melchert, H. Craig. 1998. The dialectal position of Anatolian within Indo-European. In Benjamin K. Bergen, Madelaine C. Plauché & Ashlee C. Bailey (eds.), *Proceedings of the twenty-fourth annual meeting of the Berkeley Linguistics Society: Special session on Indo-European subgrouping and internal relations*, 24–31. Berkeley, CA: Berkeley Linguistics Society.
- Melchert, H. Craig. 2004. *A dictionary of the Lycian language*. Ann Arbor: Beech Stave Press.
- Melchert, H. Craig. 2009. Deictic Pronouns in Anatolian. In Kazuhiko Yoshida & Brent Vine (eds.), *East and west. Papers in Indo-European studies*, 151–161. Bremen: Hempen.
- Melchert, H. Craig. 2012. Luvo-Lycian dorsal stops revisited. In Roman Sukač & Ondřej Šefčík (eds.), *The sound of Indo-European 2: Papers on Indo-European phonetics, phonemics and morphophonemics*, 206–218. München: Lincom Europa.
- Mikkola, Jooseppi J. 1913. *Urslavische Grammatik: Einführung in das vergleichende Studium der slavischen Sprachen*. Vol. 1. 3 vols. Heidelberg: Carl Winter's Universitätsbuchhandlung.
- Mimoxod, Roman A. 2022. Srednevolžskaja abaševskaja kul'tura i kul'tura kolokolovidnyx kubkov: nabroski k semejnemu portretu. *Arxeologija Evrazijskix stepej* (2). 122–150. <https://doi.org/10.24852/2587-6112.2022.2.122.150>.
- Mimoxod, Roman A., Evgenij I. Gak, Tat'jana E. Xomutova, Natalija E. Rjabogina & Aleksandr V. Borisov. 2022. Paleoëkologija – kul'turogenез – metalloprodukcija: pričiny i mexanizmy smeny èpox v kul'turnom prostranstve juga vostočnoj evropy v konce srednej – načale pozdnej bronzy. *Rossijskaya Arxeologija* 1. 24–38.
- Mittnik, Alissa, Chuan-Chao Wang, Saskia Pfrenkle, Mantas Daubaras, Gunita Zariņa, Fredrik Hallgren, Raili Allmäe, et al. 2018. The genetic prehistory of the Baltic Sea region. *Nature Communications* 9(1). 442. <https://doi.org/10.1038/s41467-018-02825-9>.
- Molodin, Vjačeslav I., Andrej V. Epimaxov & Žanna V. Marčenko. 2014. Radiouglerodnaja xronologija kul'tur èpoxi bronzy Urala i juga Zapadnoj Sibiri: principy i podxody, dostiženija i problemy. *Vestnik Novosibirskogo gosudarstvennogo universiteta. Seria: Istorija, filologija* 13(3). 136–67.
- Mommsen, Theodor. 1854. *Römische Geschichte*. 1st edn. Vol. 1. 3 vols. Leipzig: Weidmannsche Buchhandlung.
- Mommsen, Theodor. 1865. *Römische Geschichte*. 4th edn. Vol. 1. 3 vols. Berlin: Weidmannsche Buchhandlung.
- Monier-Williams, Monier. 1899. *A Sanskrit-English dictionary*. Oxford: Clarendon Press.
- Morgenstierne, Georg. 1938. *Indo-Iranian frontier languages. Vol. II: Iranian Pamir languages (Yidgha-Munji, Sanglechi-Ishkashmi and Wakhi)*. Oslo: H. Aschehoug & Co. (W. Nygaard).
- Morgenstierne, Georg. 1974. *Etymological vocabulary of the Shughni group*. Wiesbaden: Reichert.
- Morgenstierne, Georg, J. H. Elfenbein, D. N. MacKenzie & Nicholas Sims-Williams. 2003. *A new etymological vocabulary of Pashto* (Beiträge zur Iranistik 23). Wiesbaden: Reichert.
- Morgunova, N. L. & O. S. Khokhlova. 2013. Chronology and periodization of the Pit-Grave culture in the region between the Volga and Ural rivers based on

- radiocarbon dating and paleopedological research. *Radiocarbon* 55(3). 1286–1296. <https://doi.org/10.1017/S0033822200048190>.
- Müller, Friedrich. 1873. *Allgemeine Ethnographie*. Wien: Alfred Hölder (Beck'sche Universitäts-Buchhandlung).
- Müller, Max. 1853. The Veda and Zend-Avesta. In *Chips from a German workshop*, vol. 1, 62–80. 2nd edn. London: Longmans, Green and Co.
- Mumm, Peter-Arnold. 1999. Deutsch *Kamm*, *Kimme* und die Bedeutung von idg. **ǵombʰo-*, **ǵembʰ-*. In Wolfgang Schindler & Jürgen Untermann (eds.), *Grippe, Kamm, und Eulenspiegel. FS für Elmar Seebold zum 65. Geburtstag*, 295–312. New York: De Gruyter.
- Murphy, Eileen M. & Aleksandr A. Khokhlov. 2016. Biocultural analysis of the prehistoric populations of the Volga region. In David W. Anthony, Dorcas R. Brown, Oleg D. Mochalov, Alexandr A. Khokhlov & Pavel F. Kuznetsov (eds.), *A Bronze Age landscape in the Russian steppes: the Samara Valley Project* (Monumenta Archaeologica 37), 149–216. Los Angeles, California: UCLA Cotsen Institute of Archaeology Press.
- Narasimhan, Vagheesh M., Nick Patterson, Priya Moorjani, Nadin Rohland, Rebecca Bernardos, Swapan Mallick, Iosif Lazaridis, et al. 2019. The formation of human populations in South and Central Asia. *Science* 365(6457). <https://doi.org/10.1126/science.aat7487>.
- Narten, Johanna. 1964. *Die sigmatischen Aoriste im Veda*. Wiesbaden: Otto Harrassowitz.
- Narten, Johanna. 1968. Zum “proterodynamischen” Wurzelpresens. In J. C. Heesterman, G. H. Schokker & V. I. Subramoniam (eds.), *Pratidanam: Indian, Iranian, and Indo-European studies presented to Franciscus Bernardus Jacobus Kuiper on his sixtieth birthday*, 9–19. De Gruyter.
- Narten, Johanna. 1969. Idg. ‘Kinn’ und ‘Knie’ im Avestischen: *zanauua*, *zānu.drājah-*. *Indogermanische Forschungen* 74. 39–53.
- Narten, Johanna. 1986. Zum Vokalismus in der Gatha-Überlieferung. In Rüdiger Schmitt & Prods Oktor Skjærvø (eds.), *Studia Grammatica Iranica. Festschrift für Helmut Humbach*, 257–278. München: R. Kitzinger.
- Neri, Sergio. 2013. Zum urindogermanischen Wort für ‘Hand’. In Adam Cooper, Jeremy Rau & Michael Weiss (eds.), *Multi Nominis Grammaticus: Studies in classical and Indo-European linguistics in honor of Alan J. Nussbaum on the occasion of his sixty-fifth birthday*, 185–205. Ann Arbor: Beech Stave Press.
- Nettle, Daniel. 1999. Is the rate of linguistic change constant? *Lingua* 108. 119–136.
- Neu, Erich. 1976. Zur Rekonstruktion des indogermanischen Verbalsystems. In *Studies in Greek, Italic, and Indo-European linguistics offered to Leonard R. Palmer on the occasion of his seventieth birthday* (Innsbrucker Beiträge zur Sprachwissenschaft 16), 239–254. Innsbruck: Institut für Sprachwissenschaft der Universität Innsbruck.
- Nichols, Johanna. 1997. The epicenter of the Indo-European linguistic spread. In Roger Blench & Matthew Spriggs (eds.), *Archaeology and language I: Theoretical and methodological orientations*, 122–148. London: Routledge.
- Norbruis, Stefan. 2021. *Indo-European origins of Anatolian morphology and semantics: Innovations and archaisms in Hittite, Luwian and Lycian*. Leiden University PhD dissertation.
- Norbruis, Stefan. 2023. On the -θ- in Greek οἶσθα ‘you know’ < **uoid-th₂e*. *Glotta* 99. 227–239.

- Nordqvist, Kerkko & Volker Heyd. 2020. The forgotten child of the wider Corded Ware family: Russian Fatyanovo culture in context. *Proceedings of the Prehistoric Society* 86. 65–93. <https://doi.org/10.1017/ppr.2020.9>.
- Nowak, Ronald M. & John L. Paradiso. 1983. *Walker's mammals of the world*. 4th edn. Vol. 1. Baltimore & London: The Johns Hopkins University Press.
- Nussbaum, Alan J. 1976. *Caland's "Law" and the Caland system*. Cambridge, Massachusetts: Harvard University.
- Nyberg, H. S. & Bo Utas. 1988. *Frahang-i pahlavik. Edited with transliteration, transcription and commentary from the posthumous papers of Henrik Samuel Nyberg*. Wiesbaden: Otto Harrassowitz.
- Obrador-Cursach, Bartomeu. 2020. *The Phrygian language*. Leiden: Brill.
- Oettinger, Norbert. 1994. Pferd und Wagen im Altiranischen und Anatolischen. Zur Frage ererbter Termini. In Bernhard Hänsel & Stefan Zimmer (eds.), *Die Indogermanen und das Pferd. Akten des Internationalen interdisziplinären Kolloquiums Freie Universität Berlin, 1.–3. Juli 1992*, 67–76. Budapest: Archaeolingua.
- Oettinger, Norbert. 2014. Die Indo-Hittite-Hypothese aus heutiger Sicht. *Münchener Studien zur Sprachwissenschaft* 67(2). 149–176.
- Olalde, Iñigo, Selina Brace, Morten E. Allentoft, Ian Armit, Kristian Kristiansen, Thomas Booth, Nadin Rohland, et al. 2018. The Beaker phenomenon and the genomic transformation of northwest Europe. *Nature* 555(7695). 190–196. <https://doi.org/10.1038/nature25738>.
- Olander, Thomas. 2019. Indo-European cladistic nomenclature. *Indogermanische Forschungen* 124(1). 231–244.
- Olander, Thomas (ed.). 2022. *The Indo-European language family: A phylogenetic perspective*. Cambridge: Cambridge University Press.
- Ollett, Andrew. 2014. Evidence of laryngeal coloring in Proto-Indo-Iranian. *Historische Sprachforschung* 127. 150–165.
- Olsen, Birgit A. 1989. A trace of Indo-European accent in Armenian. *Historische Sprachforschung* 102(2). 220–240.
- Olsen, Birgit A. 1999. *The noun in Biblical Armenian: origin and word formation: with special emphasis on the Indo-European heritage* (Trends in Linguistics 119). Berlin: Mouton de Gruyter.
- Olsen, Birgit A. & Rasmus Thorsø. 2022. Armenian. In Thomas Olander (ed.), *The Indo-European language family: A phylogenetic perspective*, 202–222. Cambridge: Cambridge University Press.
- Orel, Vladimir E. 1998. *Albanian etymological dictionary*. Leiden: Brill.
- Osthoff, Hermann. 1890. Anlautend indog. sr- im lateinischen. In Hermann Osthoff & Karl Brugmann (eds.), *Morphologische Untersuchungen auf dem Gebiete der indogermanischen Sprachen*, vol. 5. Leipzig: Verlag von S. Hirzel.
- Palmér, Axel I. 2019. *Traces of 'Pre-Indo-Iranian'. Chronological layers and structural characteristics of early Indo-Iranian loanwords*. Leiden University Master's thesis.
- Palmér, Axel I., Anthony Jakob, Rasmus Thorsø, Paulus Van Sluis, Cid Swanenvleugel & Guus Kroonen. 2021. Proto-Indo-European 'fox' and the reconstruction of an athematic *k*-stem. *Indo-European Linguistics* 9(1). 234–263.
- Panzer, Baldur. 1982. Ist das Französische eine Satem-Sprache? Zu den Palatalisierungen im Ur-Indogermanischen und in den indogermanischen Sprachen. In Otto Winkelmann & Maria Braisch (eds.), *Festschrift für Johannes Hubschmid zum 65.*

- Geburtstag. Beiträge zur allgemeinen, indogermanischen und romanischen Sprachwissenschaft*, 101–114. Bern: Francke Verlag.
- Papac, Luka, Michal Ernée, Miroslav Dobeš, Michaela Langová, Adam B. Rohrlach, Franziska Aron, Gunnar U. Neumann, et al. 2021. Dynamic changes in genomic and social structures in third millennium BCE central Europe. *Science Advances* 7(35). eabi6941. <https://doi.org/10.1126/sciadv.abi6941>.
- Parpola, Asko. 2012. Formation of the Indo-European and Uralic (Finno-Ugric) language families in the light of archaeology: Revised and integrated ‘total’ correlations. In Riho Grünthal & Petri Kallio (eds.), *A linguistic map of prehistoric northern Europe* (Suomalais-Ugrilaisen Seuran Toimituksia = Mémoires de La Société Finno-Ougrienne 266), 119–184. Helsinki: Suomalais-Ugrilainen Seura.
- Parpola, Asko. 2015. *The roots of Hinduism: The early Aryans and the Indus civilization*. Oxford: Oxford University Press.
- Parpola, Asko. 2022. Formation of the Indo-Iranian languages – locations & dates according to archaeological evidence. In Peter M. Scharf (ed.), *Indian linguistic studies in honor of George Cardona. Vol. II: Historical linguistics, Vedic, etc.*, 1–83. Providence: The Sanskrit Library.
- Pedersen, Holger. 1895. Das indogermanische *s* im Slavischen. *Indogermanische Forschungen* 5(1). 33–87.
- Pedersen, Holger. 1900. Die gutturale im Albanesischen. *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete der Indogermanischen Sprachen* 36(3). 277–340.
- Pedersen, Holger. 1909. *Vergleichende Grammatik der keltischen Sprachen. I: Einleitung und Lautlehre*. Göttingen: Vandenhoeck & Ruprecht.
- Pedersen, Holger. 1913. *Vergleichende Grammatik der keltischen Sprachen. II: Bedeutungslehre (Wortlehre)*. Göttingen: Vandenhoeck & Ruprecht.
- Pedersen, Holger. 1931. *Linguistic science in the nineteenth century: Methods and results*. (Trans.) John Webster Spargo. Cambridge: Harvard University Press.
- Pedersen, Holger. 1938. *Hittitisch und die anderen indoeuropäischen Sprachen*. 1st edn. København: Levin & Munksgaard.
- Petit, Daniel. 2004. L’adjectif lituanien *súdrus* / *sûdrús*. *Bulletin de la Société de Linguistique de Paris* (1). 259–279.
- Petit, Daniel. 2018. The phonology of Baltic. In Jared Klein, Brian Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics* (Handbücher zur Sprach- und Kommunikationswissenschaft = Handbooks of Linguistics and Communication Science 41.3), 1640–1651. Berlin: Mouton de Gruyter.
- Peyrot, Michaël. 2013. *The Tocharian subjunctive: a study in syntax and verbal stem formation* (Brill’s Studies in Indo-European Languages & Linguistics 8). Leiden: Brill.
- Peyrot, Michaël. 2018. Tocharian agricultural terminology: Between inheritance and language contact. In Guus Kroonen, James P. Mallory & Bernard Comrie (eds.), *Talking Neolithic: Proceedings of the workshop on Indo-European origins held at the Max Planck Institute for Evolutionary Anthropology, Leipzig, December 2–3, 2013* (Journal of Indo-European Studies Monograph Series 65), 242–277. Washington, D.C.: Institute for the Study of Man.
- Peyrot, Michaël. 2022. Tocharian. In Thomas Olander (ed.), *The Indo-European language family: A phylogenetic perspective*, 83–101. Cambridge: Cambridge University Press.

- Pictet, Adolphe. 1859–1863. *Les origines indo-européennes ou les Aryas primitifs. Essai de paléontologie linguistique*. 2 vols. Paris: Joël Cherbuliez.
- Pijnenburg, Wilhelmus J. J. 1989. Eine germanisch-baltoslawische Isoglosse. *Historische Sprachforschung* 102(1). 99–106.
- Pinault, Georges-Jean. 1982. A neglected phonetic law: The reduction of the Indo-European laryngeals in internal syllables before yod. In Anders Ahlqvist (ed.), *Papers from the 5th International Conference on Historical Linguistics*, 265–272. Amsterdam: John Benjamins Publishing Company.
- Pinault, Georges-Jean. 2021, March 27. *Kinship terms at the crossroads of linguistics and anthropology* [Paper presentation]. In Power, gender and mobility: Features of Indo-European society. Online conference, March 26–27, 2021. University of Copenhagen.
- Pokorny, Julius. 1959. *Indogermanisches etymologisches Wörterbuch*. 2 vols. Bern, München: A. Francke.
- Porzig, Walter. 1954. *Die Gliederung des indogermanischen Sprachgebiets*. Heidelberg: Carl Winter Universitätsverlag.
- Pospieszny, Łukasz, Przemysław Makarowicz, Jamie Lewis, Anita Szczepanek, Jacek Górski, Piotr Włodarczak, Jan Romaniszyn, Ryszard Grygiel & Zdzisław Belka. 2023. Assessing the mobility of Bronze Age societies in East-Central Europe. A strontium and oxygen isotope perspective on two archaeological sites. (Ed.) Peter F. Biehl. *PLOS ONE* 18(3). e0282472. <https://doi.org/10.1371/journal.pone.0282472>.
- Poznik, G. David, Yali Xue, Fernando L. Mendez, Thomas F. Willems, Andrea Massaia, Melissa A. Wilson Sayres, Qasim Ayub, et al. 2016. Punctuated bursts in human male demography inferred from 1,244 worldwide Y-chromosome sequences. *Nature Genetics* 48(6). 593–599. <https://doi.org/10.1038/ng.3559>.
- Pronk, Tijmen. 2011. On the development of initial **Hu*, **Hi* and the rise of initial acute diphthongs in Baltic and Slavic. In *Accent matters: Papers on Balto-Slavic accentology* (Studies in Slavic and General Linguistics 37), 309–321. Leiden: Brill.
- Pronk, Tijmen. 2013. On the development of **in*, **im*, **un* and **um* in Slavic. In Marko Jesenšek (ed.), *Miklošičeva monografija. Ob dvestoletnici rojstva Franca Miklošiča*, 117–140. Ljubljana: Gimnazija Franca Miklošiča.
- Pronk, Tijmen. 2015. Singulative *n*-stems in indo-european. *Transactions of the Philological Society* 113(3). 327–348.
- Pronk, Tijmen. 2019. Proto-Indo-European **a*. *Indo-European Linguistics* 7(1). 122–163.
- Pronk, Tijmen. 2022. Balto-Slavic. In Thomas Olander (ed.), *The Indo-European language family: A phylogenetic perspective*, 269–292. Cambridge: Cambridge University Press.
- Puhvel, Jaan. 1994. West-Indo-European affinities of Anatolian. In George E. Dunkel, Gisela Meyer, Salvatore Scarlata & Christian Seidl (eds.), *Früh-, Mittel-, Spätindogermanisch: Akten der IX. Fachtagung der Indogermanischen Gesellschaft vom 5. bis 9. Oktober 1992 in Zürich*, 315–324. Wiesbaden: Dr. Ludwig Reichert Verlag.
- Puhvel, Jaan. 1997. *Hittite etymological dictionary. Vol. 4: Words beginning with K* (Trends in Linguistics. Documentation 14). Berlin: New York: Mouton de Gruyter.
- Pulgram, Ernst. 1958. *The tongues of Italy*. Cambridge, Massachusetts: Harvard University Press.

- Rask, Rasmus Kristian. 1818. *Undersøgelse om det gamle Nordiske eller Islandske Sprogs Oprindelse*. Kjöbenhavn: Gyldendalske Boghandlings Forlag.
- Rasmussen, Jens Elmegård. 1990. Germanic Verschärfung: Tying up loose ends. In Henning Andersen & Konrad Koerner (eds.), *Historical linguistics 1987: Papers from the 8th International Conference on Historical Linguistics (8. ICHL) (Lille, 31 August - 4 September 1987)* (Current Issues in Linguistic Theory 66), 425–441. Amsterdam: John Benjamins Publishing Company.
- Rasmussen, Jens Elmegård. 1999. *Selected papers on Indo-European linguistics. With a section on comparative Eskimo linguistics*. 2 vols. Copenhagen: Museum Tusculanum Press.
- Rassamakin, Yuri. 1999. The Eneolithic of the Black Sea steppe: Dynamics of cultural and economic development 4500–2300 BC. In M. Levine, Yuri Rassamakin, A. Kislenko & N. Tatarintseva (eds.), trans. Sarah Wright, *Late prehistoric exploitation of the Eurasian steppe*, 59–182. Cambridge: McDonald Institute for Archaeological Research.
- Rau, Wilhelm. 1957. *Staat und Gesellschaft im alten Indien*. Wiesbaden: Otto Harrassowitz.
- Reichert, Hans. 1922. Die Labiovelare. *Indogermanische Forschungen* 40. 40–81.
- Remmer, Ulla. 2011. The Avestan paradigm of *vaiiu-* ‘air, wind’ in the context of irregular accusative singular forms of vowel stems with $^{\circ}qm$ and $^{\circ}\partial$. *Indo-Iranian Journal* 54(1). 1–18.
- Renfrew, Colin. 1987. *Archaeology and language: The puzzle of Indo-European origins*. London: Jonathan Cape.
- Renfrew, Colin. 1989. They ride horses, don’t they?: Mallory on the Indo-Europeans. *Antiquity* 63(241). 843–847.
- Rieken, Elisabeth. 2009. Der Archaismus des Hethitischen: Eine Bestandsaufnahme. *Incontri linguistici* 32. 37–52.
- Rieken, Elisabeth. 2010. Das Zeichen <sa> im Hieroglyphen-Luwischen. In Aygül Süel (ed.), *Acts of the VIIth International Congress of Hittitology. Çorum, August 25–31, 2008*, vol. 2, 651–660. Ankara: Çorum Valiliği.
- Ringbauer, Harald, Yilei Huang, Ali Akbari, Swapan Mallick, Iñigo Olalde, Nick Patterson & David Reich. 2024. Accurate detection of identity-by-descent segments in human ancient DNA. *Nature Genetics* 56(1). 143–151. <https://doi.org/10.1038/s41588-023-01582-w>.
- Ringbauer, Harald, Yilei Huang, Ali Akbari, Swapan Mallick, Nick Patterson & David Reich. 2023. *ancIBD - Screening for identity by descent segments in human ancient DNA*. Preprint. Genetics. <https://doi.org/10.1101/2023.03.08.531671>.
- Ringe, Don, Tandy Warnow & Ann Taylor. 2002. Indo-European and computational cladistics. *Transactions of the Philological Society* 100(1). 59–129.
- Ringe, Donald. 1991. Laryngeals and Sievers’ law in Tocharian. *Münchener Studien zur Sprachwissenschaft* 52. 137–168.
- Ringe, Donald. 2017. Indo-European dialectology. In Jared Klein, Brian Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics* (Handbücher zur Sprach- und Kommunikationswissenschaft = Handbooks of Linguistics and Communication Science 41.1), 62–75. Berlin: De Gruyter Mouton.
- Ringe, Donald & Joseph F. Eska. 2013. *Historical linguistics: Toward a twenty-first century reintegration*. Cambridge: Cambridge University Press.
- Roberts, Benjamin W. & Marc Vander Linden. 2011. Investigating archaeological cultures: Material culture, variability, and transmission. In Benjamin W. Roberts & Marc

- Vander Linden (eds.), *Investigating archaeological cultures*, 1–21. New York, NY: Springer New York.
- Rohlf, Gerhard. 1921. Franz. *biche*, ital. *biscia* etc. *Zeitschrift für romanische Philologie* 41(1). 354–355.
- Ross, Malcolm. 1997. Social networks and kinds of speech-community event. In Roger Blench & Matthew Spriggs (eds.), *Archaeology and language I: Theoretical and methodological orientations*, 209–261. London: Routledge.
- Rozwadowski, Jan M. 1928. Cimbri – sjabri. In *Sbornik statej v čest' akademika Alekseja Ivanoviča Sobolevskogo: izdannij ko dnju ego roždenija Akademijeju nauk po počinu ego učeníkov*, 361. Leningrad: Izdatel'stvo Akademii nauk SSSR.
- Rühl, Lisa, Christoph Herbig & Astrid Stobbe. 2015. Archaeobotanical analysis of plant use at Kamennyi Ambar, a Bronze Age fortified settlement of the Sintashta culture in the southern Trans-Urals steppe, Russia. *Vegetation History and Archaeobotany* 24(3). 413–426. <https://doi.org/10.1007/s00334-014-0506-7>.
- Saag, Lehti, Sergey V. Vasilyev, Liivi Varul, Natalia V. Kosorukova, Dmitri V. Gerasimov, Svetlana V. Oshibkina, Samuel J. Griffith, et al. 2021. Genetic ancestry changes in Stone to Bronze Age transition in the East European plain. *Science Advances* 7(4). <https://doi.org/10.1126/sciadv.abd6535>.
- Sabatini, Serena, Karin Margarita Frei, Jacopo De Grossi Mazzorin, Andrea Cardarelli, Gianluca Pellacani & Robert Frei. 2022. Investigating sheep mobility at Montale, Italy, through strontium isotope analyses. *Journal of Archaeological Science: Reports* 41. 103298. <https://doi.org/10.1016/j.jasrep.2021.103298>.
- Sakhno, Serguei. 2018. The lexicon of Slavic. In Jared Klein, Brian Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics* (Handbücher zur Sprach- und Kommunikationswissenschaft = Handbooks of Linguistics and Communication Science 41.3), 1571–1585. Berlin: De Gruyter Mouton.
- Salvatori, Sandro. 2008. The Margiana settlement pattern from the Middle Bronze Age to the Parthian-Sasanian period: A contribution to the study of complexity. In Sandro Salvatori, Maurizio Tosi & Barbara Cerasetti (eds.), *The Bronze Age and Early Iron Age in the Margiana lowlands: Facts and methodological proposals for a redefinition of the research strategies*, 57–74. Oxford: Archaeopress.
- Schaffner, Stefan. 1996. Zu Wortbildung und Etymologie von altenglisch *nihol*, *nīowol* und lateinisch *procul*. *Münchener Studien zur Sprachwissenschaft* 56. 131–71.
- Scherer, Anton. 1952. Das Problem der indogermanischen Urheimat vom Standpunkt der Sprachwissenschaft. *Archiv für Kulturgeschichte* 33(1). 3–16.
- Schier, Wolfram. 2015. Chapter 5: Central and Eastern Europe. In Chris Fowler, Jan Harding & Daniela Hofmann (eds.), *The Oxford handbook of Neolithic Europe*, 99–120. Oxford: Oxford University Press.
- Schindler, Jochem. 1972. L'apophonie des noms-racines Indo-Européens. *Bulletin de la Société de Linguistique de Paris* 67. 31–38.
- Schleicher, August. 1852. Germanisch und slawisch. *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete des Deutschen, Griechischen und Lateinischen* 1(2). 141–144.
- Schleicher, August. 1853. Die ersten Spaltungen des indogermanischen Urvolkes. *Allgemeine Monatsschrift für Wissenschaft und Literatur* 786–787.
- Schleicher, August. 1855. Kurzer Abriss der Geschichte der Slawischen Sprachen. *Österreichische Blätter für Literatur und Kunst* 19. 129–131.

- Schleicher, August. 1858a. Die a-i-reihe im deutschen. *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete des Deutschen, Griechischen und Lateinischen* 7(3). 221–223.
- Schleicher, August. 1858b. Kurzer abriß der geschichte der slawischen sprache. *Beiträge zur vergleichenden Sprachforschung auf dem Gebiete der arischen, celtischen und slawischen Sprachen* 1(1). 1–27.
- Schleicher, August. 1861. *Compendium der vergleichenden Grammatik der Indogermanischen Sprachen*. 2 vols. Weimar: Hermann Böhlau.
- Schlerath, Bernfried. 1981. Ist ein Raum/Zeit-Modell für eine rekonstruierte Sprache möglich? *Zeitschrift für vergleichende Sprachforschung* 95(2). 175–202.
- Schlerath, Bernfried. 2001. Iranisch und Balto-Slawisch. *Historische Sprachforschung* 114(2). 285–289.
- Schmidt, Johannes. 1872. *Die Verwandtschaftsverhältnisse der indogermanischen Sprachen*. Weimar: Hermann Böhlau.
- Schmitt, Rüdiger. 1989. Die altiranischen Sprachen im Überblick. In Rüdiger Schmitt (ed.), *Compendium linguarum iranicarum*, 25–31. Wiesbaden: Dr. Ludwig Reichert Verlag.
- Schoubben, Niels. 2019. *DIAL/RINGUISTICS: The opposition between /l/ and /r/ in the diasystem of Vedic Sanskrit. A study in diachronic linguistics, dialectology and sociolinguistics*. Leiden University Master's thesis.
- Schrader, Otto. 1883. *Sprachvergleichung und Urgeschichte, linguistisch-historische Beiträge zur Erforschung des indogermanischen Altertums*. Jena: Hermann Costenoble.
- Schrader, Otto. 1890. *Sprachvergleichung und Urgeschichte, linguistisch-historische Beiträge zur Erforschung des indogermanischen Altertums*. 2nd edn. Jena: Hermann Costenoble.
- Schrijver, Peter. 1991. *The reflexes of the Proto-Indo-European laryngeals in Latin* (Leiden Studies in Indo-European 2). Amsterdam: Rodopi.
- Schrijver, Peter. 1997. Animal, vegetable and mineral: some Western European substratum words. In Alexander Lubotsky (ed.), *Sound law and analogy* (Leiden Studies in Indo-European 9), 293–314. Amsterdam: Rodopi.
- Schuchardt, Hugo. 1866. *Der Vokalismus des Vulgärlateins*. 1st edn. Vol. 1. 3 vols. Leipzig: B. G. Teubner.
- Shields, Kenneth Jr. 1981. A new look at the centum/satem isogloss. *Zeitschrift für vergleichende Sprachforschung* 95(2). 203–213.
- Shishlina, N. I., L. N. Koryakova & O. V. Orfinskaya. 2022. Exotic cotton textile of the Bronze Age from the Southern Trans-Urals. *Nanobiotechnology Reports* 17(5). 691–700. <https://doi.org/10.1134/S2635167622050159>.
- Sihler, Andrew. 1973. Proto-Indo-European *smH- 'pair'. *Journal of Indo-European Studies* 1(1). 111–113.
- Sims-Williams, Nicholas. 2007. *Bactrian documents from Northern Afghanistan. II, Letters and Buddhist texts*. London: Nour Foundation in assoc. with Azimuth eds.
- Sjögren, Karl-Göran, Iñigo Olalde, Sophie Carver, Morten E. Allentoft, Tim Knowles, Guus Kroonen, Alistair W. G. Pike, et al. 2020. Kinship and social organization in Copper Age Europe. A cross-disciplinary analysis of archaeology, DNA, isotopes, and anthropology from two Bell Beaker cemeteries. (Ed.) Siân E. Halcrow. *PLOS ONE* 15(11). e0241278. <https://doi.org/10.1371/journal.pone.0241278>.
- Skardžius, Pranas. 1938. Smulkmenos. *Archivum Philologicum* 7. 87.

- Skardžius, Pranas. 1941. *Lietuvių Kalbos Žodžių Daryba*. Vilnius: Lietuvos Mokslo Akademija Lietuvių Kalbos Institutas.
- Smoczyński, Wojciech. 1989. *Studia bałto-słowiańskie. Część I*. Wrocław: Zakład Narodowy im. Ossolińskich.
- Smoczyński, Wojciech. 2018. *Lithuanian etymological dictionary*. (Ed.) Axel Holvoet & Steven Young. Berlin: Peter Lang.
- Søborg, Tobias Mosbæk. 2020. *Sigmatic verbal formations in Anatolian and Indo-European: A cladistic study*. University of Copenhagen PhD dissertation.
- Solta, Georg R. 1960. *Die Stellung des Armenischen im Kreise der indogermanischen Sprachen*. Wien: Mechitharisten-Buchdruckerei.
- Sørensen, Tim F. 2017. The Two Cultures and a World Apart: Archaeology and Science at a New Crossroads. *Norwegian Archaeological Review* 50(2). 101–115.
- Specht, Franz. 1934. Zur Geschichte der Verbalklasse auf -ē. (Ein Deutungsversuch der Verwandtschaftsverhältnisse des Indogermanischen). *Zeitschrift für vergleichende Sprachforschung auf dem Gebiete der Indogermanischen Sprachen* 62(1/2). 29–115.
- Spengler, Robert N., Barbara Cerasetti, Margareta Tengberg, Maurizio Cattani & Lynne M. Rouse. 2014. Agriculturalists and pastoralists: Bronze Age economy of the Murghab alluvial fan, southern Central Asia. *Vegetation History and Archaeobotany* 23(6). 805–820. <https://doi.org/10.1007/s00334-014-0448-0>.
- Stang, Christian S. 1966. *Vergleichende Grammatik der Baltischen Sprachen*. Oslo: Universitetsforlaget.
- Stang, Christian S. 1972. *Lexikalische Sonderübereinstimmungen zwischen dem Slavischen, Baltischen und Germanischen* (Skrifter Utgitt Av Det Norske Videnskaps-Akademi i Oslo. II. Hist.-Filos. Klasse. Ny Serie. 11). Oslo: Universitetsforlaget.
- Steblin-Kamenskij, Ivan M. 1999. *Étimologičeskij slovar' vaxanskogo jazyka*. St. Petersburg: Peterburgskoe Vostokovedenie.
- Stensland, Lars. 1973. *Die Distribution der urindogermanischen sogenannten Gutturale* (Acta Universitatis Upsaliensis. Studia Slavica Upsaliensia 12). Uppsala: Rotobekman.
- Stifter, David. 2015. The language of the poems of Blathmac. In Pádraig Ó Riain (ed.), *The poems of Blathmac son of Cú Brettan: Reassessments* (Irish Texts Society, Subsidiary Series 27). London: Irish Texts Society.
- Sturtevant, Edgar H. 1926. On the position of Hittite among the Indo-European languages. *Language* 2(1). 25–34.
- Sturtevant, Edgar H. 1933. *A comparative grammar of the Hittite language*. Philadelphia: Linguistic Society of America/University of Pennsylvania.
- Sutrop, Urmas. 2012. Estonian traces in the tree of life concept and in the language family tree theory. *Eesti ja soome-ugri keeleteaduse ajakiri. Journal of Estonian and Finno-Ugric Linguistics* 3(1). 297–326.
- Swadesh, Morris. 1952. Lexico-statistic dating of prehistoric ethnic contacts: With special reference to North American Indians and Eskimos. *Proceedings of the American Philosophical Society* 96(4). 452–463.
- Szemerényi, Oswald. 1967. Slavjanskaja etimologija na indojevropejskom fone. *Voprosy Jazykoznanija* 1967(4). 3–25.
- Szemerényi, Oswald. 1979. Germanica I (1-5). *Zeitschrift für vergleichende Sprachforschung* 93(1). 103–125.
- Tadmor, Uri, Martin Haspelmath & Bradley Taylor. 2010. Borrowability and the notion of basic vocabulary. *Diachronica* 27(2). 226–246.

- Tavernier, Jan. 2007. *Iranica in the Achaemenid period (ca. 550-330 B.C.). Lexicon of Old Iranian proper names and loanwords, attested in Non-Iranian texts*. Leuven: Peeters.
- Tedesco, Paul. 1947. Sanskrit *adāḥ* 'Illud'. *Language* 23(2). 118–124.
- Thomason, Sarah G. 2001. *Language contact: An introduction*. Washington, D.C.: Georgetown University Press.
- Thorsø, Rasmus. 2023. *Prehistoric loanwords in Armenian*. Leiden University PhD dissertation.
- Tischler, Johann. 1973. *Glottochronologie und Lexikostatistik* (Innsbrucker Beiträge zur Sprachwissenschaft 11). Innsbruck: Institut für Sprachwissenschaft der Universität Innsbruck.
- Tischler, Johann. 1983–1994. *Hethitisches etymologisches Glossar* (Innsbrucker Beiträge zur Sprachwissenschaft 20). 10 vols. Innsbruck: Institut für Sprachwissenschaft der Universität Innsbruck.
- Tomaschek, Wilhelm. 1878. *Th. Pösche, Die Arier*, ang. v W. Tomaschek. *Zeitschrift für die österreichischen Gymnasien* 29. 858–862.
- Tomaschek, Wilhelm. 1883. Ethnologisch-linguistische Forschungen über den Osten Europas. *Das Ausland. Wochenschrift für Länder- und Völkerkunde* 56(2). 701–706.
- Trautmann, Reinhold. 1910. *Die altpreuussischen Sprachdenkmäler. Einleitung, Texte, Grammatik, Wörterbuch*. Göttingen: Vandenhoeck & Ruprecht.
- Trautmann, Reinhold. 1923a. Ein Kapitel aus der Lautlehre der baltisch-slavischen Sprachen. *Slavia. Časopis pro slovanskou filologii* 2. 1–4.
- Trautmann, Reinhold. 1923b. *Baltisch-Slavisches Wörterbuch*. Göttingen: Vandenhoeck & Ruprecht.
- Uesugi, Akinori. 2018. An overview on the Iron Age in South Asia. In Akinori Uesugi (ed.), *Iron Age in South Asia* (South Asian Archaeology Series 2), 1–49. Osaka: Research Group for South Asian Archaeology, Archaeological Research Institute, Kansai University.
- Uetz, Peter, Paul Freed, Ro Aguilar & Jiri Hošek. 2022. The reptile database. <http://www.reptile-database.org>. (1 December, 2022).
- Underhill, Peter A., G. David Poznik, Siiri Rootsi, Mari Järve, Alice A. Lin, Jianbin Wang, Ben Passarelli, et al. 2015. The phylogenetic and geographic structure of Y-chromosome haplogroup R1a. *European Journal of Human Genetics* 23(1). 124–131. <https://doi.org/10.1038/ejhg.2014.50>.
- Untermann, Jürgen. 2000. *Wörterbuch des Oskisch-Umbrischen*. Heidelberg: Universitätsverlag C. Winter.
- Vaan, Michiel de. 2000. The Indo-Iranian animal suffix **-āčá-*. *Indo-Iranian Journal* 43. 279–293.
- Vaan, Michiel de. 2003. *The Avestan vowels* (Leiden Studies in Indo-European 12). Amsterdam: Rodopi.
- Vaan, Michiel de. 2008. *Etymological dictionary of Latin and the other Italic languages* (Leiden Indo-European Etymological Dictionary Series 7). Leiden: Brill.
- Vaan, Michiel de. 2018. The phonology of Albanian. In Jared Klein, Brian Joseph & Matthias Fritz (eds.), *Handbook of comparative and historical Indo-European linguistics* (Handbücher zur Sprach- und Kommunikationswissenschaft = Handbooks of Linguistics and Communication Science 41.3), 1732–1749. Berlin: De Gruyter Mouton.

- Van Windekens, Albert J. 1963. L'origine ouralienne de gr. ὄναρ, etc., arm. *anurj* et alb. *ādërrë*, etc. «rêve». *Orbis* 12(2). 482–483.
- Vanags, Pēteris. 1989. On the history of Baltic *u*-stem adjectives. *Baltistica* 25(2). 113–122.
- Ventresca Miller, Alicia & Cheryl A. Makarewicz. 2019. Intensification in pastoralist cereal use coincides with the expansion of trans-regional networks in the Eurasian Steppe. *Scientific Reports* 9(1). 8363. <https://doi.org/10.1038/s41598-018-35758-w>.
- Ventresca Miller, Alicia, Emma Usmanova, Viktor Logvin, Saule Kalieva, Irina Shevnina, Andrei Logvin, Alina Kolbina, et al. 2014. Subsistence and social change in central Eurasia: stable isotope analysis of populations spanning the Bronze Age transition. *Journal of Archaeological Science* 42. 525–538. <https://doi.org/10.1016/j.jas.2013.11.012>.
- Villanueva Svensson, Miguel. 2011. Anticausative-inchoative verbs in the northern Indo-European languages. *Historische Sprachforschung* 124. 33–58.
- Vine, Brent. 1978. On the metrics and origin of Rig-Vedic *ná* 'like, as'. *Indo-Iranian Journal* 20. 171–193.
- Vogel, Johann C. & Nikolaas J. Van Der Merwe. 1977. Isotopic Evidence for Early Maize Cultivation in New York State. *American Antiquity* 42(2). 238–242. <https://doi.org/10.2307/278984>.
- Vries, Jan de. 1977. *Altnordisches etymologisches wörterbuch*. 2nd edn. Leiden: E.J. Brill.
- Waag, A. 1941. *Nirangistan, der Awestatraktat über die rituellen Vorschriften* (Iranische Forschungen). Leipzig: J. C. Hinrichs.
- Wachter, Rudolf. 2007. Persephone, the threshing maiden. *Die Sprache* 47(2). 163–181.
- Walde, Alois. 1910. *Lateinisches Etymologisches Wörterbuch*. 2nd edn. Heidelberg: Carl Winters Universitätsbuchhandlung.
- Wang, Chuan-Chao, Sabine Reinhold, Alexey Kalmykov, Antje Wissgott, Guido Brandt, Choongwon Jeong, Olivia Cheronet, et al. 2019. Ancient human genome-wide data from a 3000-year interval in the Caucasus corresponds with eco-geographic regions. *Nature Communications* 10(1). 590. <https://doi.org/10.1038/s41467-018-08220-8>.
- Watkins, Calvert. 1995. *How to kill a dragon: Aspects of Indo-European poetics*. Oxford: Oxford University Press.
- Weiss, Michael. 2017. Gk. τίω 'I honor' and τιμή 'honor'. In Ivo Hajnal, Daniel Kölligan & Katharina Zisper (eds.), *Miscellanea Indogermanica. Festschrift für José Luis García Ramón zum 65. Geburtstag*, 869–880. Innsbruck: Institut für Sprachen und Literaturen der Universität Innsbruck, Bereich Sprachwissenschaft.
- Weiss, Michael. 2021. Barley in Anatolian, Tocharian, and elsewhere: A fine-grained analysis. In Hannes A. Fellner, Melanie Malzahn & Michaël Peyrot (eds.), *Lyukenmer ra. Indo-European studies in honor of Georges-Jean Pinault*, 513–526. Ann Arbor: Beech Stave Press.
- West, Martin L. 2007. *Indo-European poetry and myth*. Oxford: Oxford University Press.
- Whitney, William D. 1879. *A Sanskrit Grammar*. Leipzig: Breitkopf & Härtel.
- Whitney, William D. 1905. *Atharva-veda Samhitā. Second half: Books VIII to XIX*. Cambridge, Massachusetts: Harvard University.
- Wigman, Andrew M. 2023. Unde vēnisti? *The prehistory of Italic through its loanword lexicon*. Leiden University PhD dissertation.
- Wilkin, Shevan, Alicia Ventresca Miller, Ricardo Fernandes, Robert Spengler, William T.-T. Taylor, Dorcas R. Brown, David Reich, et al. 2021. Dairying enabled Early

- Bronze Age Yamnaya steppe expansions. *Nature* 598(7882). 629–633.
<https://doi.org/10.1038/s41586-021-03798-4>.
- Wiley, Gordon R. & Philip Phillips. 1958. *Method and theory in American archaeology*. Chicago: The University of Chicago Press.
- Winter, Werner. 1962. Die Vertretung indogermanischer Dentale im Tocharischen. *Indogermanische Forschungen* 67. 16–35.
- Witczak, Krzysztof T. 2003. Studies in Armenian etymology (31–35). *Annual of Armenian linguistics* 22–23. 83–87.
- Witzel, Michael. 1987. On the localisation of Vedic texts and schools (Materials on Vedic Śākhās, 7). In Gilbert Pollet (ed.), *India and the ancient world. History, trade and culture before A.D. 650. P.H.L. Eggermont Jubilee Volume*, 173–213. Leuven: Departement Oriëntalistiek.
- Witzel, Michael. 1995. Early Indian history: Linguistic and textual parameters. In George Erdosy (ed.), *Language, material culture and ethnicity. The Indo-Aryans of ancient South Asia*, 85–125. Berlin: De Gruyter Mouton.
- Witzel, Michael. 2003. Linguistic evidence for cultural exchange in prehistoric Western Central Asia. *Sino-Platonic Papers* 129. 1–70.
- Wodtko, Dagmar S., Britta Sofie Irslinger & Carolin Schneider. 2008. *Nomina im indogermanischen Lexikon* (Indogermanische Bibliothek. 2. Reihe, Wörterbücher). Heidelberg: Winter.
- Woodhouse, Robert. 1998. On PIE. tectals. *Indogermanische Forschungen* 103. 40–60.
- Wright, Joseph & Elizabeth M. Wright. 1898. *The English dialect dictionary*. 6 vols. Oxford: Oxford University Press.
- Yakubovich, Ilya. 2019. Lydian *kof(i)*- ‘water’. In *eDiAna*, s.v. **Hab-*.
<https://www.ediana.gwi.uni-muenchen.de/dictionary.php?lemma=352>.
- Young, Steven. 2005. ‘Gravel’ in Baltic and Slavic. *Baltistica* 6. 95–100.
- Zdanovich, Gennady B. & Dmitry G. Zdanovich. 2002. The ‘Country of Towns’ of southern Trans-Urals and some aspects of steppe assimilation in the Bronze Age. In Katie Boyle, Colin Renfrew & Marsha Levine (eds.), *Ancient Interactions: East and West in Eurasia*, 249–263. Cambridge: McDonald Institute for Archaeological Research.
- Zeng, Tian Chen, Leonid A. Vyazov, Alexander Kim, Pavel Flegontov, Kendra Sirak, Robert Maier, Iosif Lazaridis, et al. 2023. *Postglacial genomes from foragers across Northern Eurasia reveal prehistoric mobility associated with the spread of the Uralic and Yeniseian languages*. Preprint. Genomics.
<https://doi.org/10.1101/2023.10.01.560332>.
- Zeuss, Kaspar. 1837. *Die Deutschen und die Nachbarstämme*. München: Ignaz Joseph Lentner.
- Zimmer, Stefan. 1990. *Ursprache, Urvolk und Indogermanisierung. Zur Methode der Indogermanischen Altertumskunde* (Innsbrucker Beiträge zur Sprachwissenschaft. Vorträge und kleinere Schriften 46). Innsbruck: Institut für Sprachwissenschaft der Universität Innsbruck.
- Zinkevičius, Zigmas. 1966. *Lietuvių kalbos dialektologija*. Vilnius: Leidykla “mintis.”

7. Word index

7.1. Indo-Aryan

7.1.1. Sanskrit (Vedic)

ákāniṣ-, 108
akhātsur, 111 fn. 147, fn. 148
agní-, 62
ágra-, 143
āṅgāra-, 62
áchā, 64
ajá-, 42, 43 fn. 47
ajā-, 42
ajína-, 44, 45
áti-, 159
atireka-, 159
adó, 145 fn. 174, fn. 175
ádhmās-, 52
ánīka-, 80
anṛkṣará-, 140
áp-, 120, 143
apa-mítya-, 157
ápāñc-, 80
ábhakta, 30
abhīka-, 80
amúm, 145
ayós, 144
ará-, 200
árdha-, 202 fn. 206
ardhá-, 202 fn. 206

arvāñc-, 64
arvāvát-, 64
áva, 145
avár, 64
ávi-, 120
ávithura-, 142
avós, 144
aṣṭá-, 12 fn. 14
asáu, 145, fn. 175
astá-, 12 fn. 14
ahí-, 43
āṇḍá-, 140
āviṣ, 49, 147
á sajāmi, 83
íti, 103
idhmá-, 103
iṣṭi-, 12 fn. 14
iṣṭí-, 12 fn. 14
uccā, 64
ucyasi, 63
út tavīti, 166
upa-pakṣá-, 81, 82
urvārā-, 169, 182
ūrṇóti, 169
ūrvá-, 169, 170
ṛtí-, 141, fn. 171
ṛti-, 141, fn. 171
eḍa-, 43
edh-, 103
édha-, 104

o-, 144
óṣṭha-, 61, 178
kárṇa-, 112
karná-, 112
kart-, 72, fn. 93
kapāla-, 212
kám, 48
kāma-, 108
kāyamāna-, 108
kumārā-, 153
kumbhá-, 212
kúha, 155
kṛṇóti, 75, fn. 96
kṛtvas, 72
kṛpīta-, 63
kṛśá-, 109
kṛśyati, 109
kṛṣṇá-, 73
ketú-, 154
kravyá-, 152
kravyád-, 152
kleś-, 110
kṣut-māra-, 158
kṣudrá-, 74
kṣod-, 74
kṣódas-, 74
kṣobh-, 153
khanⁱ, 108
khaní-, 108
khanī-, 108

khā-, 109
khād-, 111 fn. 147
khādati, 110
gābhasti-, 42
gāya-, 58, 59
gardh-, 60
gārdha-, 60
gā-, 57
gāḍha-, 59
gādhā-, 59, 60
gāy-, 57
gāya-, 57
gāyati, 57
gāyatrā-, 57
gāh-, 59
gāhate, 59
girāti, 100, 101
girí-, 138
gīti-, 57
gurú-, 138
gītsa-, 60
grāma-, 145, 146
grāvan-, 138, 146, 190
grīvā-, 138
cakārśa, 109
cakrá-, 202 fn. 207
cakhāda, 111 fn. 147
cat(t)ra-, 202 fn. 207
cānas-, 108
cārman-, 116
cītti-, 154
citrā-, 154
cet-, 154
céta-, 154
cāya-, 154
chāyā-, 90
jātu-, 88 fn. 126
jana-māra-, 158
jap-, 54
jabdha-, 97
jāmbhate, 97
jaráyati, 136
jalp-, 54

jāsa-, 137
jāsamāna-, 137
jāsáyati, 137
jinóti, 137
jīryati, 136
jīvā-, 59
jñu-bādh-, 126, 127
jvalí-, 54
jvalati, 54, 55
tak-, 164
tákṣati, 165, 166, fn. 182
tákṣan-, 166
tanú-, 165
tanuka-, 165
támisrā-, 118
tálpa-, 119
tavīti, 166
tāpáyati, 167
tāṣṭi, 165, 166, fn. 182
tucchyā-, 89, 90
ṭṇātti, 168
toṣáyati, 168
dákṣiṇa-, 131
dádhi, 133, 134
dadhnás, 133
daśát-, 130
dáhati, 134
ḍīrghā-, 132
ḍūrvā-, 133
ḍṛṣád-, 99, 100 fn. 139
ḍṛh-, 132, 133
drāghmán-, 141
dhāmati, 52
dhárman-, 135
dhānā-, 52
dhārāya-, 53, 135
dhāráyati, 53
dhinoti, 51
dhī-, 135, fn. 170
dhenú-, 51
dhmā-, 52
dhyā, 135 fn. 170

dhruvā-, 96
ná, 78
nagná-, 80
nayí-, 45
nāvanīta-, 45
nāgá-, 80
nābhā-nédiṣṭha-, 148
nābhi-, 148
ní asakta, 83
niṣ-, 159
nítya-, 115
niṣ, 115
níṣṭya-, 115
nīcā, 79
nīta-, 45
nīví-, 46
netra-, 45
nemí-, 200
nyāk, 79
nyāñc-, 79
pakṣá-, 81, 82
pákṣas-, 82 fn. 115
pattí-, 159, 160
pārā bhāvayati, 128
parihvīt-, 57
parjánya-, 161
pārśu-, 115
parṣān, 137
palāva-, 83
palitā-, 71
pávana-, 190
paví-, 200
paścā, 64, 161
paścāt, 161
pāṃsú-, 160
pājas-, 81
pāyáyati, 82
pārśvā-, 115, 116
pārṣṇi-, 88
pipárti, 89
píbat, 144
pīpāya, 83
púras, 120

- purás*, 163
pūr, 120
pūṣkara-, 163
pūṣpa-, 163
pūrva-, 162
pr̥chāti, 76 fn. 101
pr̥ṣṭí-, 115
pratīka-, 80
pratyāñc-, 80, 176
pramará-, 157
prāṇa-dṛh-, 132
phéna-, 164
babhrú-, 125
bahíṣ, 49
bahú-, 177 fn. 188
bādh-, 126 fn. 164, 127
bādhá-, 126, 127
bādhate, 126
bāhate, 126
bībhatsate, 126, 127
budhná-, 164
búdhyate, 129
bubhukṣā-māra-, 158
bṛhas-pāti-, 128
bodh-, 177 fn. 190
bodháyati, 129
bodhi-, 177 fn. 189
bradhná-, 50
bhága-, 124
bhaṅgá-, 128
bhaj-, 30
bhánati, 117
bhārīman-, 92, 93
bhāvayati, 128
bhiṣáj-, 99 fn. 137
bhuráti, 93
bhūri-, 94, fn. 132
bhūrjá-, 93
bhūṣati, 94
bhrāj-, 93
bhrūṇá-, 129, 130
majján-, 77
mátsya-, 30
mathāyāti, 76, 108
mathnāti, 76, 108
madh(u)vád-, 113
mánthati, 76
mánthā-, 75, fn. 97, 76
mányā-, 139
máma, 141
mayante, 157
mara-, 157
mastaka-, 78
mastíṣka-, 78
mastṛhan-, 78
máh-, 59
mām, 141
māra-, 157, 158
michamāna-, 76 fn. 101
mítya-, 157
mithás, 114
mithuná-, 114
mithuyā, 114
míthū, 114
miśrá-, 76, fn. 101
mudrá-, 158
muṣṭí-, 42
médhira-, 118 fn. 156
yábhati, 65
yáva-, 149
yāti, 105
rādh-, 139
rúc-, 156
rúci-, 156
rop-, 157
ropayati, 157
róhita-, 71
limpāti, 156
lepayati, 156
lop-, 157
lopayati, 157
vádati, 148
ván-, 122
vána-, 122
vabh-, 101
váyati, 144, 185
var-, 168, 169
varāhá-, 204
varāhayú-, 204 fn. 209
vártman-, 91
válśa-, 91
vādáyati, 148
vāyú-, 105
vāra-, 92
vāla-, 92
vāsáyati, 22 fn. 26
vithurá-, 142
vidh-, 142
vidhávā-, 142
vidhú-, 142, 143
vidhura-, 142, 143
vi-dhura-, 142
ví mayante, 157
viśpāti-, 122
viśpátnī-, 122
viśva-, 123
viśu-, 123
vṛkṣá-, 92 fn. 130
vyath-, 142
vratá-, 169
śákala-, 150, 151
śayú-, 106
śasá-, 67
śāka-, 106
śākhā-, 150, 151
śāpa-, 68, 69
śāri-, 151
śārikā-, 151
śísira-, 107
śíśu-māra(ka)-, 158
śuná-, 70
śúṣka-, 104
śúṣyati, 148
śéva-, 107
śośáyati, 147
śyāmá-, 67
śyāmā-, 67
śyāwá-, 149
śráyate, 150

- śrávas-*, 68
śreṣ-, 110
śroṇá-, 112
śróṇi-, 112
śleṣ-, 110
śvaka-, 151
śvítma-, 70
śvíndate, 71 fn. 90
śvetá-, 70
sa-, 48
saṃdhā-, 86, 180
sá-kṛt, 72
sá-garbhya-, 48
sabhā-, 117
sám, 47, 48
sama-, 48
samá-, 48
sámmissla-, 76 fn. 101
sárva-, 123
savá-, 88
savyá-, 163
sasañja, 83
sasyá-, 189 fn. 196
sahásra-, 3, 176
sārāṅga-, 118 fn. 157
-sīm, 95
sudív-, 176
sudrú-, 62, 63
sudrvàm, 63
súrā-, 87
sūkará-, 203
sūcī-, 203 fn. 208
sthūri-, 94 fn. 132
snāvan-, 46
spharīs, 179
sphurāti, 88, 89
srāmá-, 118, 119
hanmī, 137
hári-, 98
háríta-, 71
háva-, 56
hávate, 55
hásta-, 41, fn. 40
hiraṇín-, 98, fn. 135
hiraṇmáya-, 98, fn. 135
hiraṇya-, 98
huraś-cít-, 56
hemantá-, 97
hemantá-jabdha-, 97
hváya-, 55 fn. 63, 66
hvárate, 56
hváras-, 56
hvātar-, 55 fn. 63, 66
7.1.2. Khovar
amišt, 76
don, 133
7.1.3. Pāli
sūkara-, 203
7.1.4. Nepāli
sūgar, *sūgur*, 203
7.1.5. Sinhalese
(h)ūrā, 203
7.2. Iranian
7.2.1. Old Avestan
aorā-cā, 64
auua-, 144
ap-, 143
āuuiš, 147
āṭ, 102
ufiia-, 101
uruuata-, 169
uruuarā-, 182
ūitī, 103, fn. 142
kaiiā, 108
kāma-, 108
kudā, 155
gaiia-, 58
cōiθ-, 154
cisti-, 154
jiiātu-, 58
tauuā, 166
tašan-, 166
tāšt, 165, 166 fn. 184
°tāšti, 165
daēnā-, 135, fn. 170, 136
darəga-, 132
dāraiiat, 53
dərəz-, 132, fn. 168, 133
baga-, 124
-biš-, 99 fn. 137
būiri-, 94
būždiiāi, 94
nōišt, 79
nīš, 115
mā.nā, 141
var-, 168
vīspa-, 123
rāma-, 118 fn. 158
rəma-, 118 fn. 158
spənta-, 69
srauuah-, 68
zauua-, 56
zasta-, 41
zbaiia-, 55 fn. 63, 66
hām, 47
huuō, 145, fn. 175
7.2.2. Young Avestan
aēsma-, 103
aora, 64
aošta-, 61
aipi-varəc-, 121
aiβiθūra-, 142
auua-, 144, 145
auuarə, 64, 65
auui.bāḍa-, 126
ayra-, 143
ap-, 143
aza-, 42
azina-uuant-, 44
āat, 102
āuuiš, 147

- ādim*, 95
ərəti-, 141
i-, 95
izaēna-, 43, 44 fn. 49
uiti, 103, fn. 142
upa-sraiiata, 150
ufiia-, 101
uruuarā-, 182
uši, 61
kan-, 108
karəna-, 112
karšnaz-, 73
kāma-, 108
kənti, 108
xumba-, 212
xšaodah-, 74
xšudra-, 74
xšufsqn, 153
x^vaē-paiti-, 162
x^vaē-paiθiia-, 162
x^varaiti, 88
gaiia-, 58
gairi-, 138
gā-, 57
gāθra-, 57
gərəda-, 60
gramənt-, 136
grīuuā-, 138
carəman-, 116
cārā-, 74, 75
cinman(a)-, 108
cisti-, 154
taošaiieiti, 90
tak-, 164
taka-, 167
tašan-, 166
tāpaiieiti, 167
tāšti, 166 fn. 184
tusən, 89, 178
tūiri-, 183 fn. 193
θaŋjaiieiti, 119, 120
daēnā-, 135, fn. 170, 136
daēnu-, 51
darəzaiieiti, 133
dašina-, 131
dažaiti, 134, fn. 169
dāðmainiia-, 52
dānō.karš(a)-, 52
dāraiiehi, 53
-di-, 95
-dim, 95
-dī, 95
-dīš, 95
druua-, 96
paēnaēna-, 83 fn. 116
paēman-, 82
paitiiaŋc-, 80 fn. 108, 176
pauruua-, 162
parsa-, 203
pasāvadim, 95
paskāt, 161
pasca, 161
pāzaŋ^vhaŋt-, 81 fn. 114
pqsnu-, 160
pərəsu.masah-, 115
fraorənta, 168, 169
fra-spara-, 88
frā.vərəsa-, 91
baoiio, 94
baodaiieiti, 129
baodah-, 177
baodi-, 177 fn. 189
baŋa-, 124
baβra-, 125
barəməiiaona-, 92, 93
bərəj-, 128
bərəjiia-, 128
bišaziia-, 99 fn. 137
būidiia-, 129
būšiiənt-, 94
brāzaiti, 93
naēza-, 158, 159
nabā-, 148, fn. 176
nabā-nazdišta-, 148
nāfa-, 148
nōiŋ, 79
niiāŋc-, 79
ni-sirinaoiti, 150
ništara-, 115 fn. 153
maiiat, 157
maŋna-, 80
mana, 141
mastərəŋan-, 78
masiia-, 30
mazga-, 77
mązdra-, 118 fn. 156
miθō, 114
miθβana-, 114
miθβara-, 114
mīšti, 76
yauua-, 149
yaθna, 78
vaēm, 105
vaiiqm, 105
vaiio, 105
vaiiu-, 105
vanā-, 122
var-, 168
varāza-, 204
varəc-, 121
varəsa-, 91
varəša-, 92 fn. 130
vərəca-, 121
viðauua, 142
vīxaδ-, 111 fn. 147
vī-rāzaiti, 155
vīspa-, 123
vīspaiti-, 122
vīša-, 12 fn. 14
vīžuuənc-, 123
rāzaiti, 155
saē, 106
sarəta-, 107
sāma-, 67
siiāmaka-, 67
siiāuuu°, 149
sirinaoiti, 150

sukurəna-, 203 fn. 208
sūkā-, 203 fn. 208
spaēta-, 70
spaiieiti, 66
spaka-, 151
spanah-, 70
spara-, 88, 89
spāta-, 66
spāṇhaiti, 66
spənta-, 69
sraiiata, 150
srauuah-, 68
srišāiti, 110
zaēni-budra-, 50
zairi.gaona-, 98
zauua-, 55, 56
zauuaiti, 55
zaranaēna-, 98
zaranu^o, 98
zarañiia-, 98
zarənu^o, 98
zarənu-maini-, 139
zarštuua-, 99
zasta-, 41
zūrō.jata-, 56
zbaiia-, 55 fn. 63, 66
zbarənt-, 56
zbarəmma-, 56
zbātar-, 66, 55 fn. 63
haoiia-, 163
hao-safnaēna-, 199
ha-, 48
ha-kərəṭ, 72
habāspa-, 117
haṇ-dāiti, 86
hama-, 48
ham-zəṇbaiiaδβəm, 97
harəta-, 118
hahiia-, 189 fn. 196
hāu, 145
hqm, 47
-hi-, 95
hurā-, 85 fn. 121, 27

huška-, 104
hū-, 203
 7.2.3. Old Persian
aurā, 64
ap-, 143
ava-, 144
avahya-rādiy, 139
uvaipašiya-, 162
kan-, 108
kāma-, 108
kāra-, 152
carman, 116
dasta-, 41
dārayātiy, 53
-di-, 95
duruva-, 96
niy-asaya, 66
pasti-, 159
frāha⁽ⁿ⁾jam, 83
baga-, 124
manā, 141
-ši-, 95
zura, 56
ha^m-gmata-, 47
^huška-, 104

7.2.4. Middle Persian

7.2.4.1. Pahlavi

afsar-, 107
afsār-, 107
azag, 42
babrag, 125
bē, 49
čārag, 74
čarm, 116
dam-, 52
dān(ag), 52
dār-, 53
darmān, 135
dast, 41
dašn, 131

dēnōdag, 51
drōd, 96
ēzm, 103
grāmag, 145
grīw, 138
gurbag, 124
hagriz, 72
han-ḡaman, 47
hōš-, 147
hūg, 203
hūkar(ag), 203
hur, 87
hušk, 104
ḡaw, 149
kām, 108
kan-, 108
karr, 112
ōy, 144
pahlūg, 115
pēm, 82
sabz, 68
sag, 151
sard, 107
spandarmad, 69
spandān, 69
spar-, 88
spēd, 70
sraw, 68
syā, 149
šōy-, 74
tanuk, 165
tuhīg, 89
wan, 122
wars, 91
zarr, 98

7.2.4.2. Manichaean

'hynz-, 119
'myxs, 77 fn. 102
'šynz-, 83, 84
'wy, 144
'spyd, 70
'ymg, 103

byc, 49
crm, 116
d'ng, 52
d'r-, 53
drm'n, 135
dst, 41
dšn, 131
han-zaman, 47
k'm, q'm, 108
qn-, 108
kr, qr, 112
s'ywg, 106
sg, 151
sy'w, 149
šwy-, 74
twyg, 89
zr, 98

7.2.5. Parthian

'myj-, 77 fn. 102
br'z-, 93
byc, byž, 49
byh, 49
nyspy-, 66
rād, 139
wys'r, 107
x'z, 110, 111

7.2.6. Sogdian

'γ'z, 59
γ'z, 59
γr'n-, 136
'ks-, 109
'njmn, 47
'nk'yr, 62
'nkwpyr, 83 fn. 116
'zw-, 55
βr'z'nt, 93
crm, 116
δ'n, 52
δ'r-, 53
δm'k, 52
δst, 41

δync-, 119
γr-, 138
γr'm'k, 145
γγšc'n'k, 60
j'y, 57
k'm, q'm, 108
kn-, 108
krn, qrn, 112
mnδ-, 75
p'z, 81
prs', 115
pšpr-, 88
pym'kh, 164
rxpyn, 82, 85
spn'k, 160
spty, 70
spy-, 66
srt, 107
š'w, 149
t'š-, 165
w-, 144
w'β, 101
w'f, 101
wn-, 122
wrs, 91
y'β, y'b, 65 fn. 81
zmy, 103
zyrn, 98
ž'y, 57

7.2.7. Khotanese

auštä, 61
aysdām, 42
kārra-, 112
khāš-, 110
ggari-, 138
gara-, 138
gāha-, 57
ttäš-, 165
ttušāa-, 89
tcārman-, 116
thaṃj-, 119, 120
dajs-, 134

dam-, 52
dalš-, 133
dasta-, 41
dānā-, 52
dīnū, 51
nīyaka-, 45
pāysa-, 81
pālsu-, 115
pā'sa, 203
phāna, 160
buro, 94
māstai, 78
mijsaā-, 77 fn. 103
ysarra-günä, 98
ysīrra-, 98
rrāys-, 155
vaspuḍai, 88
šāva-, 149
ššūta-, 70
ššīya-, 70
sāda-, 107
syūta-, 106
ham-, 47
hāysä-, 43 fn. 45
hurā-, 87
huška-, 104

7.2.7.1. Old Khotanese

kaṃggan-, 108
pašš-, 66
maṃth-, 75
valj-, 121

7.2.8. Khwarezmian

by'βy-, 65
δ'n, 52
δ'ry-, 53
δy(n), 51, fn. 61
γ'z, 59
γr'm, 145, 146
mšnc-, 84 fn. 119
p'z, 81 fn. 114
s'ry-, 107

s'w, 149

sry-, 107

x(w)r-, 88

zβ-, 55

7.2.9. Bactrian

αδοριγο, 159

καρο, 152

λπουο, 96

ραζ-, 155

σαβαγο, 68, 69

7.2.10. Balochi

dān, 52

khāδ-, 110

mant-, 75

nēmag, 45

šāf-, 65

sīkūn, *sīnkur*, 203 fn.

208

spēt, 70

7.2.11. Modern

Persian

angišt, 62

an-ŷuman, 47

āvang(ān), 83, 84

barāzīdan, 93

bisūdan, 66

bun, 122

čarm, 116

damīdan, 52

dast, 41

fīn, 164

girībān, 138

gorbe, 124

gurs, 91

hēzum, 103

isfand, 69

kām, 108

kandan, 108

kar, 112

pahlū, 115

pīnu, 82

rāy, 139

ruxbīn / *rixbīn*, 85

sabz, 68

sag, 151

sār, *sāarak*, 151

sard, 107

sipardan, 88

sugur(na), 203 fn. 208

šustan, 74

tanuk, 165

xāyīdan, 110

xōš-, 147

xošk, 104

zar, 98

7.2.12.Ormuri

pa-néxta, 115, fn. 153

pīn, 83 fn. 116

7.2.13. Ossetic

I *æfsæryn* / D *æfsærun*,
88

I *æm-byrd* / D *æm-burd*,
47

I *æryom* / D *æryon*, 145,
146

I *ævzær*, 56

I *æxsæv* / D *æxsævæ*, 82
carm, 116

I *daryn* / D *darun*, 53

I *dymyn* / D *dumun*, 52

fars, 115, 116

faxs, 81, 82 fn. 115

I *faz* / D *fazæ*, 81

I *fænyk* / D *funuk*, 160

I *færsk* / D *færskæ*, 115

I *fistæg* / D *fest(æg)*,
159

I *fynk* / D *finkæ*, 164

I *iræd* / D *ærwæd*, 169

jæw, 149

kom, 108

I *nīz* / D *nez*, 158, 159

sald, 107

saw, 149

I *sælyn* / D *sælun*, 107

I *sizær* / D *sezær*, 106

I *tyssæg*, 89

I *x_oy* / D *xu*, 203

I *x_oyrx* / D *xurxæ*, 85

I *x_oysk'* / D *xusk'(æ)*,
104

7.2.14. Parači

žō, 149

7.2.15. Pashto

āsp-, 66

carmán, 116

gabína, 83 fn. 116

gar, 138

gar-ég : *-ed-*, 136

kan-, 108

kuṇ, 112

lās, 41

nyar-, 100

puxtáy, 115

raxpín/ŋ, 85 fn. 120, 86

sābā, 68, 69

spay, 151

spəy, 151

škun, 203 fn. 208

tāš, 89

wána, *wúna*, 122

wéxtá, 91

wuč, 104

zan-γozay, 190

zāray, *zúray*, 190

žay, 43 fn. 45

7.2.16. Roshani

ravand, 182

7.2.17. Shughni

đūn, 52

nay-, *nid-*, 45
puz, 81 fn. 114
rivand, 181 fn. 191, 182
sēpc, 68
sipēd, 70
žōz-, 59

7.2.18. Tajik (Wanji)

gis, 182

7.2.19. Wakhi

dast, *δast*, 41
дын, 52
кын-, 108
кым, 112
nəsp(ə)r-, 88
nəž(γ)ər-, 100
pərnəc, 45
пыrs, 115
пыз, 81 fn. 114
təš, 89
wəsk, 104
yazn, 44, fn. 49
yijín, 44 fn. 49

7.2.20. Wanetsi

sugun/r, 203 fn. 208
wušt, 91

7.2.21. Yaghnobi

don, 181 fn. 191
žoy-, 57

7.2.22. Yazghulami

γār, 138
ǰay-, 57
raván, 182
wis, 182

7.2.23. Yidgha

awáž-, 83
γar, 138
ize, 43

kʷunʷo, 73
nǎya, 45
 7.2.24. Munji
nǎyo, 45
yijya, 43 fn. 45

7.3. Baltic

7.3.1. Lithuanian

aludė, 86 fn. 123
angis, 143
anglis, 62
ātlaikas, 159
au-, 145
áudžia, 144
auklė, 144
aurė, 64, 65
áusčioti, 61
ausis, 61
áusti, 144
avidė, 86 fn. 123
avìs, 120
aviža, 182, 213
až(ú), 47 fn. 55
bābras, 125
bādas, 126, 127
bangà, 128
báudyti, 129
báudo, 129
bė, 49
bėbras, 124
bebrùs, 124, 125
bėda, 126
bėdà, 126, 127
bėržas, 93
bėsti, 126, 127
blañdas, 50
bódžiasi, 126
bodùs, 127
bósti, -*ta*, 126, 127
bóstis, 126, 127

brėkšti, -*ta*, 93
briaunà, 129, 130
budrùs, 50
būrỹs, 94
bùrti, 94
bùs, 94
dainà, 136
daļgis, *daļgē*, 76 fn. 99
darýti, 53, 54
dāro, 53
dēga, 134
dėgti, 134
derėti, 54, 135
dermė, 135
dešimtis, 130
dėšim(t)s, 130
dėšinas, 131
dėti, 86 fn. 123
dienà, 51 fn. 60
dienì, 51, fn. 60
diėvas, 148
dirvà, 133
diržas, 132, 133
duburỹs, 143
dubùs, 143
dūmai, 52
dūmti, -*ia*, 11 fn. 13, 52
dúona, 52, 53, 181
ė, 102
erškėtis, 140
gajùs, 58
gardùs, 60
geriù, 139
gėsta, 137
gėsti, 137
gieda, 57
giedóti, 57, 58
girià, 138
gìrnos, 190
gývas, 59
góžti, -*ia*, 59
grāma, 136
gramañtas, 145, 146

graméti, 136
grōmulas, 145
gromul̃s, 145, 146
grūma, 136
gruméti, 136
grūmulas, 145, 146
gūmulas, 146
ič, 103
iesmē, 103
ilgas, 132
išsukos, 85
it, 103
javaĩ, 149
jója, 105
jóti, 105
jūnk̃ti, -*sta*, 63
kánda, 110
kāpti, 69
kāras, 152
kārias, 152
kāršti, -*ta*, -*ia*, 109
kařtas, 72
kāsti, 110
kerai, 74, 75
keréti, 74
kéršas, 73
k̃inis, 108, 109, fn. 145
Kirkšnó-upis, 73
kiřsnas, 73
klīšas, 110
klīšēs, 110
klīšti, 110
kraĩjas, 152
kumēlē, 153
kumel̃s, 153
kuřčias, 112
kuřlas, 112
kuřsti, 112 fn. 151
kuřtas, 112
kūrti, 75 fn. 96, 112
laũkan, *laukañ*, 122 fn. 161
laũkas, 122 fn. 161

laupýti, 157
laũpo, 157
liñpa, 156
lipinti, -*ina*, 156
l̃ipti, 156
mandrūs, 118 fn. 156
manēš, 141
māras, 157
māzgas, 77 fn. 104
mélžti, 183 fn. 192
menčią, 75, 76
mentē, *meñtē*, 75, 76
mentis, 75, 76
mentūris, 76
mēšti, 76
miēšti, 76
mišras, 76
mūdras, 158
mudrūs, 158
nē, 78, 79
negù, 78
neĩ, 78, 79
neĩ, 79
niežaĩ, 158
niēžas, 158
niežėti, 158, 159
nýtis, 46
núogas, 80
nuožvelnūs, 57
ō, 102
ovyje, 147
ožinis, 44
ožys, 42, 43
ožkà, 43
pajaĩ, 83 fn. 116
pasèkti, 161
paskuĩ, *pāskui*, *pāsakui*, 161
pāsukos, 85
pāt, 162
pāts, 162
pažastis, 41, fn. 39
pēdà, 160

pēlūs, 83
perkūnas, 161, fn. 181
peřti, 89
pēsčias, 159, 160, fn. 180
péstas, 160
píenas, 82
pilis, 120
pirmas, 162
piršys, 115
pūrai, 190
pūšes, 120
pušis, 120
pūškas, 163
ratà, 169
rē, 64 fn. 78
regėti, 64 fn. 78
ródyti, 139
ródo, 139
sà, 47, fn. 55
sam-, *san-*, *sq-*, 47
samdà, 86
saĩndas, 86
sárkanas, 118
sařtas, 118
saũsas, 104, 148
saũsinti, -*ina*, 147, 148
saũsyti, 147
saũso, 147
sēbras, *sēbras* 117 fn. 155
sēga, 83
sègti, 83
skaitýti, 154
skaiťo, 154
skaudėti, 74
skaudrūs, 74
skūba, 153
skubėti, 153
skubūs, 153
smāgenys, 77
smōgti, 77
spāinē, 164

spirti, -ia, 88, 89
sù, 47
súdrus, 62, 63
sùkras, 85
sukrùs, 85
sùkti, 85
sulà, 87
sunkà, 85 fn. 122
suñkti, 85 fn. 122
suñktis, 85 fn. 122
sùsas, 104
sùskis, 104
šakà, 151
šakalyš, 150, 151
šalnà, 107
šáltas, 107
šálti, 107
šāpai, 68, 69
šāpas, 68, 69
šárka, 151
šáuti, -na, 66, fn. 82, 90
šeimà, 117
šeimẽ, 117
šeiryš, 106
šéka, 106
šékas, 106
šémas, 67
šývas, 67, 149
šlāvē, 68
šliēti, -ja, 150
šlovẽ, 68 fn. 85
šveñtas, 69, 70
šviēčia, 70
šviēsti, 70
šviñta, 71 fn. 90
švisti, 71 fn. 90
tākas, 167
talpà, 119
tašýti, 165
tāšo, 165
tausýtis, 168
taūsos, 168
tēka, 164

tekėti, 164
telpa, 119
tėvas, 165
tilpti, 119
tingti, -sta, 119
tingùs, 120
trendėti, -ėja, 168
trenėti, 168
tūkstantis, 191 fn. 198
tùkti, 167
tùščias, 89, 90
tuštėti, 90
ūdra, 158
ungurys, 143
úoksas, 61
úostas, 61
ūpas, 101
ùpė, 143
upis, 120
ūrva, *urvà*, 169
ūrvas, *urvas*, 169
ùž, 47 fn. 55
vadinti, 148
vālas, 92, 183
vārstas, 91
vėjas, 105
vėjus, 105
velka, 121
viduĩ, 161
viduĩ, 142
viduryš, 142, 143
vidùs, 142
viēšis, 123
viēšnamis, 123
viēšpatis, 122
viēšpats, 122
vilkėti, 121
vilki, 121
vilkti, 121
vilna, 169
vilpišys, 124
visas, 122, fn. 163, 123
žāstas, 41, fn. 39

žavėti, 55
žāvi, 55
želpúoja, 54
želpúoti, 54
žėlti, 98
želvas, 98
žem̃bti, -ia, 97
žiegždrà, 100
žiūrėti, 54
žvėris, 56
žvỹla, 54, 56
žvilti, 54, 55, 56, 57
žvirgždas, 99, 100

7.3.1.1. Old Lithuanian

bùdras, 50
patis, 162
viēšpatni, 122
žvelant-, 55
žvelanti, 54

7.3.1.2. Žemaitian

atžúlus, 57
girė, 138

7.3.2. Latvian

agrs, 143
a[t]daĩne, 51
atdiēne, 51
aúst, 144
aúžu, 144
āzis, 43
badš, 126, 127
bañga, 128
bàudīt, 129
bàudu, 129
bāzt, -žu, 126
be, 49
bębrs, 125
będa, 126, 127
będu, 126
bes, 50
best, 126, 127

- beš*, 50
bešā, 50
bez, 49
braūna, 129, 130
būra, 94
būris, 94
daīņa, 136
darīt, 53, 54
daru, 53
degt, 134
dēgu, 134
desmit, 130
dīrva, 133
dirža, 132, 133
duimt, -*stu*, 52
duōna, 52, 53
džēst, 137
džešu, 137
džēšu, 137
dziēdāt, 57
dziēdu, 57
dziņa, 138
dzire, 138
dzīvs, 59
ēršķis, 140
gāzt, -*žu*, 59
gremt, -*ju*, 136
grīva, 138, 139
ilgs, 132
jāju, 105
jāt, 105
kamēju, 108
kāmēt, 108
kārst, -*tu*, 109
karš, 152
kumele, 153
kumelš, 153
kuōst, 110
kuōžu, 110
kuřls, 112
kūrls, 112
kuřns, 112
kvitēt, 70
kvitu, 70
lāupīt, 157
lāupu, 157
lēžēju, 155
lēžēt, 155
manis, 141
meňte, 75, 76 fn. 98
mieturis, 76
miju, 157
mīt, 157
mudrs, 158
naba, 148
naīza, 158
naīzs, 158
ne, 78
nīca, 79
nīcām, 79
niēzt, 158, 159
niju, 45
nīt, 45
nuōgs, 80
paksis, 81 fn. 113
pa-nijas, 45
pa-nīnas, 45
pat, 162
pats, 162
pēlus, 83
piēns, 82
pils, 120
pirmais, 162
pusks, 163
re, 64 fn. 78
sa, 47
sàime, 106, 117
sakaļi, 150, 151
salna, 107
salts, 107
sařts, 118
sausināt, 147, 148
šaūt, -*ju*, -*nu*, 66
saūt, -*nu*, 66
sēbrs, 117 fn. 155
sēdzu, 83
segt, 83
seja, 90
sēka, 106
sēks, 106
sēms, 67
siēva, 107
skaitīt, 154
skaitu, 154
skaudrs, 74
skūbrs, 153
sleju, 150
slienu, 150 fn. 177
slīet, 150
smadzenes, 77
snāt, 46 fn. 52
snaujis, 46 fn. 53
speřt, 88
speřu, 88
sūkala, 85 fn. 122
sūkalas, 85 fn. 122
sukrs, 85
sūkt, 85 fn. 122
sula, 87
suliņas, 88 fn. 125
suō-, 47
sušķis, 104
svēts, 69, 70
sviēstnīņas, 45
svinēt, 70
šķist, 154
šķitu, 154
taks, 167
tēpu, 119
test, 165
tešu, 165
tīlpt, 119
tukšs, 89
úogle, 62
uōsta, 61
upe, 143
ūpēt, 101
ūpis, 101
urva, 169

adināt, 148
vējš, 105
vēlku, 121
viēsis, 123
viess, 123
vīlkt, 121
viss, 122, fn. 163, 123
zavēju, 55
zavēt, 55
zvēlt, 56
zvēļu, 56
zvilstu, 56
zvilt, 56, 57
zvīrgzds, 99

 7.3.3. Old Prussian

ape, 143
austo, 61
bebrus, 125
bhe, 49
corto, 72 fn. 93
crauyo, 152
dadān, 133
-dei, 95
dessemp̃ts, *dessim̃pts*,
dessim̃ton, 130
deywīs, 148
-di-, 95
-dien, 95
etbaudiñnons, 129
garian, 138
garrin, 138
geytye, *geits*, 59 fn. 69
kērmens, 116
kirsnan, 73
kragis [*kargis*], 152
krawia, 152
krawian, 152
līse, 155
luckis, 156
mulgeno [*musgeno*], 77
nabis, 148
nadele, 134

nognan, 80
pelwo, 83
pirmas, *pirmois*, 162
ructandadan, 133
salta, 107
sarke, 151
schien, 95, fn. 133
schis, 95 fn. 133
schokis, 106
sen, 47
sen-, *san-*, 47
sixdo, 100
spoayno, 164
sulo, 87
swints, 69, fn. 87
sywan, 149
-ts, 95
tūsim̃tons, 191 fn. 198
waispattin, 122
widdewū, 142
wissa-, 123
wosee, 42, 43
wosux, 42

7.4. Slavic

7.4.1. Old Church Slavic

a, 102
avě, 147
bez(ъ), 49
běda, 126, 127
běditi, 127
blago, 128
bodq̃, 126
bogatъ, 124
bogъ, 124
bosti, 126, 127
brēmę, 92
brъvъno, 45
brъdrъ, 50
bystръ, 94

cvěrbъ, 70
cvisti, 70
čajati, 154
čary, 74
čisti, 154
črbnъ, 73
čbstъ, 154, 155
čbtq̃, 154
desęrbъ, 130
desnъ, 131
divъ, 135
dlъgbъ, 132
do, 96
dъmy, 52
dymъ, 52
gladъ, 60
gora, 138
gramada, 145
gromъ, 137
grъmēti, 137
grъstъ, 42
xromъ, 118
xudъ, 74
i, 102
izlēšti, 155
izlēzq̃, 155
jadq̃, 105
jaxati, 105
javě, 147
kqsajq̃, 110
kqsati, 110
kratъ, 72
kъ, 48
kъde, 155
medvēdbъ, 113
mene, 141
mēsiti, 76
męsti, 75, 76
mętq̃, 75
mitě, 114
morъ, 157
mozgъ, 77
mōdrъ, 118 fn. 156

- nagъ*, 80
neže, 78
nicъ, 79
ništъ, 115
nizъ, 115
ni že, 79
opaky, 80
otlěkъ, 159
ovъ, 144
qglъ, 62
pero, 89 fn. 128
perq, 89
perqъ, 89 fn. 128
pěny, 164
pěšъkъ, 160
pěšъ, 159
pijъ, 82
piti, 82
platъno, 45 fn. 50
plěvy, 83
požrěti, 89, 100, 101
požъrъq, 89, 100
prilěpiti, 156
prilěpljъ, 156
pri-lъnqti, 156
probrězъgъ, 93
prъsi, 115
prъvъ, 162
prъrati, 89
radi, 139
raditi, 140
ratъ, 141
sěnъ, 90
sirъ, 106
slana, 107
slava, 68
slovo, 68
sovaatъ, 66
sovati, 90
sq-, 47
sqdъ, 86
struja, 119
studenъ, 98
sunqti, 66, fn 82
sušiti, 147
sušjъq, 147
světъ, 70
svetъ, 69
svbtěti sę, 70
sъ, 47
sъdravъ, 63, 96
sъzori, 136
sъžrěti, 136
tebě, 29 fn. 29
tekъ, 164
tesati, 165
tešъq, 165
tešti, 164
tęžъkъ, 120
tlъpa, 119
tokъ, 167
tъštъ, 89
tysqšti, 191 fn. 198
u-bogъ, 124
ubuditi, 129
ubuždъq, 129
ugasiti, 137
ugašъq, 137
usta, 61
vaditi, 148
vaditi, 148
važdъq, 148
věra, 168, 169
vlasъ, 91
vlěkъq, 121
vlěšti, 121
vrěmę, 91
vrъsta, 91
vrъtiti sę, 91
vъdova, 142
vъnъ, 122
vъpijъq, 101
vъpiti, 101
vyknqti, 64
vъsъ, 123
zelenъ, 98
zonъq, 55
zъlъ, 56, 57
zъnvati, 55
žegъq, 134
želěti, 60
želězo, 45
želězъnъ, 45
žesti, 134
žěti, 137
žito, 59 fn. 69
žъnjъq, 137
žъnъq, 137
žъrъq, 11 fn. 13, 89, 100

7.4.2. Russian Church Slavonic

čara, 74, 75
črěnъ, 112
črъviti, 98
gromada, 145, 146
izgaziti, 59
jazъno, 44
lučъ, 156
moždeni, 77
sěrъ, 67
snuti, 46 fn. 53
tekъ, 167
tyti, 166
žlъděti, 60

7.4.3. Serbian Church Slavonic

azъno, 44
jazъno, 44
sebrъ, 117

7.4.4. Croatian Church Slavonic

bronъ, 50

7.4.5. Church Slavonic

bebrъ, 125
bobrъ, 125

kr̥n̥n̥, 112
prisęgnōti, 83
rastęgo, 119
rastęšti, 119
-sęgnōti, 84
sukati, 85
svraka, 151
šui, 163
vypl'b, 101

7.4.6. Bulgarian

nícom, 79
ustá, 61
zov, 56

7.4.7. Czech

broný, 50
čísti, 154
čtu, 154
chybati, 153
jedu, 105
jeti, 105
krát, 72
krsati, 109
krsnouti, 109
louč, 156
mítvy, 114
než, 78
nicí, 79
pach, 81
pěchý, 160 fn. 180
sirý, 106
uhel, 62
úpěti, 101
úpím, 101
ven, 122
zábsti, 97
zebu, 97

7.4.7.1. Old Czech

hoj, 58
szořtí, 136

7.4.8. Polish

a, 102
bawić, 128
bawię, 128
bez, 49
bieda, 126
błogo, 128
bóbr, 125
bóg, 124
brzask, 93
brzemie, 92
budzę, 129
budzić, 129
bystry, 94
chromy, 118
chudy, 74
chybać, 153
chybam, 153
ciec, 164
ciekę, 164
cienki, 165
ciosać, 165
ciosam, 165
czar, 74
czarny, 73
czy, 89
cześć, 154
dąć, 52
długi, 132
dmę, 52
dziesięć, 130
dziw, 135
gasić, 137
gaszę, 137
głód, 60
góra, 138
gromada, 145
grzywa, 138
jądro, 140
jebać, 65
jebię, 65
kąsać, 110

kąsam, 110
kleszcze, 110
lepić, 156
lepię, 156
lezę, 155
leźć, 155
lupić, 157
lupię, 157
miedźwiedź, 113
mituś, 114
mór, 157
nagi, 80
niż, 78, 79
ów, 144
pacha, 81
piana, 164
piasek, 160
pierś, 115
pierwszy, 162
pieszy, 159
potuszę, 168
potuszyć, 168
prę, 88
przeć, 88
rota, 169
sq-, 47
sięgać, 83
sięgam, 83
sięgnąć, 83
sięgnę, 83
siwy, 149
słowo, 68
sroka, 151
suka, 151, 152
sunąć, 66
sunę, 66
suszę, 147
suszyć, 147
świat, 70
święty, 69
tęzę, 119
tężyć, 119, 120
tok, 167

topić, 167
topię, 167
tyć, 166
tyję, 166
wadzę, 148
wadzić, 148
wlec, 121
wlokę, 121
włos, 91
zdrowy, 96
z(e), 47
zielony, 98
zły, 56
zwać, 55
zwe, 55
zać, 137
żarstwa, 99
żec, 134
żerstwa, 99
żgę, 134
żnę, 137
żreć, 100
żrę, 100

7.4.8.1. Old Polish

sukać, 85
wszy, 123

7.4.9. Russian

a, 102
bávit', 128
bedá, 126
berémja, 92
bez, 49
bobr, 125
bódryj, 50
bog, 124
brevnó, 45
brezg, 93
brjúxo, 130
budít', 129
bužu, 129
býstryj, 94

cvet, 70
čáry, 74
čěrnij, 73
čest', 154
derénja, 133
désjat', 130
div, 135
dólgij, 132
dúju, 52
dut', 52
ebát', 65
ebú, 65
etí, 65
gasít', 137
gašú, 137
golód, 60
gorá, 138
gríva, 138
gverstá, 99
gverstvá, 99
gverzdá, 99, 100
xromój, 118
xudój, 74
jadró, 140
klěšči, 110
kornój, 112
kusáju, 110
kusát', 110
lepít', 156
lepljú, 156
lezt', 155
lézu, 155
luč, 156
lupít', 157
lupljú, 157
medvéd', 113
mor, 157
nag, 80
nagój, 80
ne, 78, 79
niščij, 115
pax, 81, 82
paxá, 81

pexóta, 160 fn. 180
péna, 164
perét', 88, 89, fn. 128
pérsi, 115
pérvyj, 162
pesók, 160
pěšij, 159
polóva, 83
póloz, 116
pru, 88, 89
s(o), 47
síryj, 106
sívyj, 149
sjagnút', 83
slóvo, 68
soróka, 151
sovát', 66
studít', 98
su-, 47
sujú, 66
suká, 151
sukátě, 85
súnu, 66
súnut', 66
sušít', 147
sušú, 147
svet, 70
svjatój, 69
tesát', 165
tešú, 165
tjagáju, 119
tjagát', 119, 120
tok, 167
tónkij, 165
topít', 167
topljú, 167
tóščij, 89
tušít', 168
tušú, 168
túžit', 119, 120
túžu, 119
úgol', 62
vádit', 148

vdová, 142
 verstá, 91
 ves', 123
 vne, 122
 volóč', 120
 volokú, 120
 vólos, 91
 von, 122
 vopít', 101
 vopljú, 101
 zdoróvyj, 96
 zelěnyj 98
 zjábnu, 97
 zjábnut', 97
 zloj, 56
 zorit', 136
 zov, 56
 zovát', 55
 zovú, 55
 žat', 137
 žeč', 134
 žerstvá, 99
 žgú, 134
 žilá, 59
 žnu, 137

7.4.9.1. Old Russian

bologo, 128
 bronii, 50
 bьbrъ, 125
 čara, 74
 desnъ, 131
 duti, 52
 đьtu, 52
 gajati, 57
 goi, 58, 59
 gromada, 145
 komonъ, 153
 krjatati, 72 fn. 93
 mene, 141
 mitusъ, 114
 pazъ, 81, 82
 perunъ, 161

ratъ, 141
 rota, 169
 sjabrъ, 117
 svьnuti, 71 fn. 90
 teči, 164
 teku, 164
 tьska, 90
 vxu, 123
 vyče-, 63, 64
 žbrati, 100
 žbru, 100

7.4.10. Polabian

müezenü, 77
 müzdin, 77
 sauko, 151, 152

7.4.11. Serbo-Croatian

a, 102
 bādar, 50
 bāviti se, 128
 bez, 49
 bijeda, 126
 bištar, 94
 blāgo, 128
 bōg, 124
 brēme, 92
 brēza, 93
 brvno, 45
 būdīm, 129
 búditī, 129
 cřn, 73
 cřven, 98
 čājati, 154
 čara, 74
 část, 154
 čísti, 154
 dābar, 125
 dēsēt, 130
 dēsni, 131
 đīvan, 135
 dmēm, 52
 dūg, 132

dūjēm, 52
 dūti, 52
 gāšīm, 137
 gāsiti, 137
 gāziti, 59
 glād, 60
 gòra, 138
 gramáda, 146
 grīva, 138
 grmada, 146
 gromáda, 146
 hròm, 118
 hūd, 74
 javi, 147
 jèbati, 65
 jédro, 140
 kljěšte, 110
 kljěštiti, 110
 krât, 72
 krétati, 72 fn. 93
 křn, 112
 kusáju, 110
 kúsati, 110
 lījepīm, 156
 lijèpiti, 156
 ljěsti, 155
 ljěžēm, 155
 lūč, 156
 lúpiti, 157
 mēdojēd, 113
 mēdvjed, 113
 méne, mēne, 141
 môr, 157
 moždena, 77
 nāg, 80
 neže, 78
 nīšt, 115
 nīt, 46
 òvāj, 144
 òvas, 182
 pijèsak, 160
 pjěna, 164
 pjěše, 159

pljëva, 83
përsi, 115
përvi, 162
râdi, râdi, 139, 140
râditi, 140
rât, 141
rota, 169
säv, 123
ségnuti, 83
sëzati, 83, 84
sëžem, 83
siv, 149
skúpsti, 153
slôvo, 68
sûnëm, 66
sûnuti, 66
sûšim, 147
sûšiti, 147
svêt, 69
svijet, 70
svrâka, 12, 73, 151
tânak, 165
tâšt, 89
tëčëm, 164
tëci, 164
tësati, 165
tëšëm, 165
titi, 166
tôk, 167
tòpim, 167
tòpiti, 167
ùgalj, 62
ústa, 61
vân, 122
vâpijëm, 101
vâpiti, 101
vjëra, 168
vlâs, 91
vrijëme, 91
vúcëm, 121
vúci, 121
zâo, 56
zâprëm, 88

zâprijeti, 88
zdräv, 96
zëbëm, 97
zëlen, 98
zëpsti, 97
zövëm, 55
zvâti, 55
žânjëm, 137
žëci, 134
žëti, 137
žëžëm, 134
žúdjeti, 60

7.4.12. Slovene

brësk, 93
gòj, 58
mësti, 75
mëtem, 75
pâz, 81
plâz, 116
potúšiti, 168
rëšâk, 140
s(â), 47
so-, 47
šuj, 163
vâdim, 148
vâditi, 148
zarâdi, 139, 140
zorím, 136
zoríti, 136
zòv, 56
žrëm, 100
žrëti, 100

7.4.13. Ukrainian

niž, 78, 79

7.5. Albanian

ai, ajó, atá, 145
bardhë, 93
bredh, 93
di, 135

djathë, 131, 133
djathtë, 131
djeg, 134
dorë, 41
drithë, 100
dhi, 43, 44
dhirë, -në, 44
dhjëtë, 130
e, 102
edh, 43, fn. 44
glatë, 132
grykë, 139
gur, 138
gjashtë, 131
gjatë, 132
hedh-, 74 fn. 95
helq, 121
kóhë, 12
mjel, 183
ndjath, 131
ndjek, 164
nus, 46 fn. 53
pall, 83
para / pár(ë), 163
pärë, 162
pi, 82
plak, 12
pleq, 12
qoj, 12
sembër, 117 fn. 155
sórrë, 12, 73, 151
(sh)typ, 138
tridhjetë, 130
thimë, 67
ujk, 12
ujq, 12
vej, 144, 185
vesh, 22 fn. 26
vis, 43 fn. 44
zog, 12
zórrë, 12
zot, 12

7.6. Anatolian

7.6.1. Hittite

amm-, 141
azzaštēni, 30
euan-, 149
ḥapa-, 143
 =*kkān*, 48
kallar-, 11 fn. 11
kammarš-^{zi}, 11 fn. 11
karaš, 100
karije/a-^{zi}, 116
karza, 72 fn. 93
katta, 11 fn. 11
keššar, 41
kikla-, 106 fn. 144
kuer-^{zi}, 75 fn. 96
kunna-, 70
nai-ⁱ, *nē-^{a(ri)}*, 45
nekumant-, 80
paḥḥur/paḥḥuen-, 20
pangarit, 177 fn. 188
paršna, 88
 =*pat*, 162
padḍa-ⁱ, 127
 =(š)*šan*, 48
šuyē/a-^{zi}, 66
dai-ⁱ / *ti-*, 135
takš-^{zi}, 166
talugai-, 132, fn. 167
^{NINDA}*dannaš-*, 53
daššu-, 49 fn. 58
ter-^{zi} / *tar-*, 53 fn. 62
u-, 145
uḥḥi, 147
uatku-, 164

7.6.2. Cuneiform
 Luwian

ḥāpa/i-, 143
kallar-, 11 fn. 11
katmars(i)a-, 11 fn. 11
zanta, 11 fn. 11

7.6.3. Hieroglyphic
Luwian

ta-ka-mi-i, 11 fn. 11

7.6.4. Lycian

sñta, 11 fn. 11

7.6.5. Lydian

kud, 155

os-, 145

osk, 145

7.6.6. Carian

u-, 145

7.7. Armenian

acut, 62, fn. 75

anic, 159

awj, 62

ayc, 43

c^aax, 151

eker, 110

erkan, 190

ham-, 48

hawari, 144

hing, 12

hiwsn, 166 fn. 183

jag, 12

jaunem, 55

jeṛn, 41

šov, 149

keam, 58

kečⁱ, 88 fn. 126

kit^c, 88 fn. 126

merk, 80

mi, 48

neard, 46

nk^ct^cem, 80

omn, 48

owsanim, 63

sarik, 151

saṛn, 107

sēr, 107

spaṛnam, 89

ur, 65

xacanem, 111, 185

7.8. Celtic

7.8.1. Gaulish

Dex(s)iua, 131

7.8.2. Old Irish

á, 105

áth, 105

aub, 143, 144 fn. 173

báidim, 59

Bibar, 125

brú, 129

caraid, 108

cíar, 67

clú, 68

co, *cu*, 48

creth, 75 fn. 96

cruth, 75, fn. 96

cuire, 152

deisen, 131

denait, 51

derb, 96

dess, 131

enech, 80

fedb, 142

fid, 143

fír, 169

galar, 11 fn. 11

gúal, 54, 62

guth, 55

ibid, 144

intech, 167

mesc, 76

mligid, 183 fn. 192

nocht, 81

-ráidi, 139

snáth, 46

snúd, 46

-som, 48

tál, 166

tanae, 165

teichid, 164

-tella, 119

to-ucci, 63

ua-, 145

úr, 190

7.8.3. Middle Irish

medg, *medc*, 77

muin, 139

sén, 84

suth, 88

7.8.4. Old Breton

beuer, 125

daeru, 96

7.8.5. Middle Breton

brez, 93 fn. 131

hasou, 163

paras, 75 fn. 96

pred, 75 fn. 96

7.8.6. Breton

draok, *dreok*, 133

7.8.7. Middle Welsh

aswy, *asw*, 163

hoenyn, *hwynyn*, 84

peri, 75 fn. 96

pryd, 75 fn. 96

vy, 141

7.9. Germanic

7.9.1. Gothic

af-lifnan, 156

af-skiuban, 153

auso, 61

baidjan, 127

bi-laibjan, 156

**bi-sauljan*, 87

biuhts, 64

fairzna, 88

faran, 89

ga-, 48

gan-iman-, 48

gredus, 60

haidu-, 154

haims, 117

harjis, 152

haurds, 72 fn. 93

heiwa-frauja-, 107

hoha, 150

ip, 159

miluks, 183 fn. 192

naqaps, 80

nei, 79

nipjis, 115

qairnus, 190

sibja, 117

sniwan, 46 fn. 52

suma-, 48

taihsua, 131

tulgus, 132, 133

pusundi, 191

widuwo, 142

7.9.2. Old High German

arawīz, 182

awi-zoraht, 147

dehsala, 166

eit, 104

fūst, 42

gersta, 100

haso, 67

hlinēn, 150

mana, 139

muntar, 118 fn. 156

naba, 148

nāen, 46

quiti, *kuti*, 88 fn. 126

sceran, 75 fn. 96

scirm, 116

scouwōn, 71

sinkel, 84

sol, 87

wāra, 169

zeso, 131

7.9.3. Middle High German

krimmen, 146

senkel, 84

7.9.4. German

Hummel, 153

Kamm, 97 fn. 134

scheinen, 71 fn. 92, 154

Schramme, 119

Ziege, 43

7.9.5. Dutch

harder, 73

tarwe, 133

7.9.6. Old Saxon

kneo-beda, 126

under-badon, 127

7.9.7. Old English

beber, *bebor*, 125

beorma, 93

ēawis, 147

fæmne, *fémne*, 82

fealg, 116

forwost, *forwest*, 162

grimman, 137

hafola, 212

hāwi, 149

hrǣ(w), *hrā(w)*, 152

miscian, 76

niweseoða, 79

to, 96

7.9.8. English

bed, 126
shine, 71 fn. 92, 154

7.9.9. Old Norse

beðr, 126, 127
beiða, 127
bíða, 127
biðja, 127
björk, 93
bjórr, 125
eimr, 104
feima, 82
föl, 83
gestr, 42 fn. 41
geyja, 55, 56
goð geyja, 56
goðgá, 56
gráðr, 60
gramr, 137
há, 106
hárr, 67
heimr, 107
hey, 106
horr, 109
hræ, 152
kné-beðr, 126
kol, 54
kol, 62
kváða, 88 fn. 126
lágr, 155
langr, 132
mergr, 77
nakinn, 80 fn. 109
nøf, 148
nøkkviðr, 81
reyfa, 157
samfæðra, 48
samr, 48
skjóta, 66
skráma, 119
sperna, *sporna*, 89

súga, 85 fn. 122
þeffja, 167
þungr, 120
viðr, 143

7.9.10. Faroese

følva, 83
kváð, 88 fn. 126
kváð(a), 88 fn. 126

7.9.11. Norwegian

bada, 127
brok, 94
dra, 121 fn. 160
galder, 11 fn. 11
kode, 88 fn. 126
kvåde, 88 fn. 126
saula, 87
søyre, 147

7.9.12. Old Swedish

nakuþer, 81

7.9.13. Swedish

brokig, 94
harr, 73
naken, 81 fn. 111
näck, 81 fn. 111

7.10. Greek

ἀ-, 48
ἀγείρω, 146
ἀδελφεός, 12, 48
αἶθω, 103
αἶξ, 43, 44
αἰσθάνομαι, 147
αἶω, 147
ἄλοξ, αὐλαξ, 121
ἄμα, 48, fn. 56
ἁμαρτή, 49 fn. 59
ἀμέλγω, 183 fn. 192
αὖ, 145

αὐτός, 145
βαθύς, 60 fn. 70
βένθος, 60 fn. 70
βέομαι, 58
βῆσσα, 59, 60 fn. 70
βιβρώσκω, 100
βιός, 12
βορέας, 138
βόσκω, 58
βούλομαι, 60, fn. 72
βρεχμός, 78
γόμφος, 97 fn. 134
γυμνός, 80
δασύς, 49 fn. 58
δαυλός, 49 fn. 58
δειράς, 138, 139
δείρη, 139
δεκάς, -άδος, 130
δεξιός, 131
δέρα, 139
δέρη, 138, 139
δεῦρο, 64, 65, fn. 80
διπλός, 72
δολιχός, 132, fn. 167
ἐθέλω, 60
εἶς, 48
ἔλκω, 121
ἐνθρεῖν, 53 fn. 62
ἐνώπα, 80
ἐρέβινθος, 182, 212
ἔτεκον, 166 fn. 182
έτι, 159
εὐδία, 176
ζειαί, 149
ζῶον, 12
ζώω, 58
ἡίθεος, 142
θαῦμα, 135
θήρ, 56
κάρταλλος, 72 fn. 93
κινέω, 12
κλέος, 68
κλίνω, 150

κοέω, 71
 κοινός, 48
 κοίρανος, 152
 κονίς, 159
 κόραξ, 151
 κορώνη, 151
 κύκλος, 37
 κύμβη, 212
 λάχνη, 92, fn. 130, 176
 λιπαίνω, 156
 λοιπός, 159
 μεταξύ, 49
 μίσγω, 76
 μόρος, 158
 νάχω, 60 fn. 71
 νευρά, 46
 νέω, 20, 46
 νήχω, 60 fn. 71
 νήω, 60 fn. 71
 ξύν-, 48
 ὄδε, 96
 οἶομαι, 147
 οἶφω, 178
 οἶφω, 65
 ὀμ-, 49
 ὀμοῦ, 49
 ὀμός, 48, 49
 ὄνος, 38 fn. 38
 οὔς, 61
 π(τ)όλις, 120
 παλαστή, 42
 πάλη, 83 fn. 117
 παλύνω, 83, fn. 117
 παραβολή, 68 fn. 84
 πάρος, 163
 Περσεφόνη, 137
 πήγνυμι, 81
 πῖθι, 82
 πρᾶξις, 75
 πρόσωπον, 80
 πτέρνη, 88
 πῦρός, 190
 ρήτρα, 169

σᾶμα, 135
 σῆμα, 135
 σκιά, 90
 σύν-, 48
 σύνθεσις, 86, 180
 σῦς, 48, 49 fn. 58
 ταναός, 165
 ταῦς, 167
 τέκτων, 166
 τέρας, 75
 τίω, 154
 τῦρός, 183 fn. 193
 ὕλη, 87
 φάρη, 50
 φαρύνει, 50
 φημί, 117
 χεῖλοι, 3
 χεῖρ, 41
 χλωρός, 98
 χόρτος, 41, 42, 176
 χρόμος, 137

7.11. Italic

7.11.1. Latin

adūlor, 92
amnis, 143, 144 fn. 173
antiquus, 80
ars, 141 fn. 171
asinus, 38 fn. 38
audiō, 147
auris, 61
aut, 145
avēna, 182
bēstia, 61
caenum, 109 fn. 145
caput, 212
cārus, 108
cieō, 12
cīmex, 67
cīvis, 107
com-, 48

comātus, 91
cornix, 73, 151
crātis, 72 fn. 93
crucem, 138
cum, 48
curtus, 112 fn. 149
dēclīnō, 150
dēnsus, 49 fn. 58
dexter, 131
duplex, 72
duplus, 72
et, 102, 159
fermentum, 93
ferōx, 80
ferveō, 93
fiber, feber 125
firmus, 135
fodiō, 127
fundus, 164
gravis, 114
gremium, 146
helvus, 98
hīr, īr, 41
hordeum, 100
hostis, 42 fn. 41
hostus, 41, 42
iānus, 105
ignis, 20, 62
indulgeō, 133
ita, 103
lēvis, 114
longus, 132
lūx, 156
mīlle, 176
misceō, 76
monīle, 139
mulgeō, 183 fn. 192
mūtāre, 114
mūtuus, 114
nēmen, 46
neō, 46
nervus, 46
nī, 79

nūdus, 80
ōstium, 61
parabola, 68 fn. 84
-per, 72
perna, 88
post, 161
praestō, 41, 42 fn. 41
pulvis, 83
pūrus, 190
quercus, 161 fn. 181
sagum, 84 fn. 118
sem-, 48
semel, 48
semper, 72
sim-, 48
simplex, 48
spernō, 89
spūma, 164
sūcus, 85 fn. 122
sulcus, 121
tenebrae, 118
tenuis, 165
texō, 166
tumescō, 167
ubī, 155
vadum, 59
vērus, 169
vidua, 142, 186
vīvus, 59
volpēs, 124
vorō, 100

7.11.2. Oscan

-pert, 72
puf, 155

7.11.3. Umbrian

orer, 64 fn. 77
-per, 72
pufe, 155

7.12. Phrygian

auto-, 145

7.12.1. Old Phrygian

keneman, 109

7.13. Tocharian

7.13.1. Tocharian A

āp-, 143
kālytār, 150
kālymār, 150
kukāl, 37 fn. 37
kñuk, 139
tpār, 134
pātar, 127
pärwat, 162
mäsšunt, 78
yā-, 105
lipñat, 156
ša-, 48
tsar, 41
tsäk-, 134

7.13.2. Tocharian B

āp-, 143
iyā-, 105
kaltār, 150
kärweñe, 190
kušīñ, 71 fn. 91
kokale, 37
*kwants**, 70
kwā-tār, 55, 178
cake, 165
ñās, 141
tapre, 134
tāno, 53
tānk-, 120
pratsāko, 80
malkwer, 183 fn. 192
mäntāññ-, 76
mäntānā-, 76

yap, 149
yänmä^{śke}/śšā-, 65, 178
yäp-, 65, 178
šar, 41
še, 48
*šñor**, 46
saiwai, 163
tsäk-, 134
tsälp-, 119

Nederlandse samenvatting

Het doel van dit proefschrift is om de vroege prehistorische verspreiding van de Indo-Iraanse tak van de Indo-Europese taalfamilie te achterhalen, d.w.z. de periode tussen de opsplitsing van de Indo-Europese vooroudertaal en het Proto-Indo-Iraans, aan de hand van taalkundige, archeologische en genetische gegevens.

Hoofdstuk 1 leidt de geschiedenis in van het onderzoek naar de positie van het Indo-Iraans binnen de Indo-Europese taalfamilie. Een van de gangbaarste hypothesen verbindt het Indo-Iraans met het Balto-Slavisch. Het eerder opgevoerde bewijs voor een Indo-Slavische groepering bestaat voornamelijk uit lexicale isoglossen, maar het is onduidelijk in welke mate deze doorslaggevend zijn. Om deze reden is een herevaluatie noodzakelijk.

Hoofdstuk 2 bespreekt de theoretische achtergrond van interne classificatie en verschillende manieren om verwantschap binnen taalfamilies te modelleren. Er wordt speciale nadruk gelegd op de methodologische overwegingen met betrekking tot lexicaal bewijs voor interne classificatie.

Hoofdstuk 3 geeft individuele etymologische besprekingen van potentiële Indo-Slavische lexicale isoglossen. De isoglossen zijn in vier secties onderverdeeld: aannemelijke gedeelde innovaties (3.2), mogelijke gedeelde innovaties (3.3), onzekere isoglossen (3.4) en verworpen isoglossen (3.5).

In hoofdstuk 4 worden de gegevens uit hoofdstuk 3 geanalyseerd. De conclusie is dat, hoewel niet kan worden uitgesloten dat veel Indo-Slavische lexicale isoglossen archaïsmen zijn, een klein aantal aannemelijke gedeelde innovaties het best kan worden verklaard door uit te gaan van een periode van Indo-Slavische eenheid na de opsplitsing van de vooroudertaal. Het is echter nog onduidelijk of Indo-Slavisch deel uitmaakte van een dialectcontinuüm of dat het een aparte tak in de nauwe zin van het woord was.

Hoofdstuk 5 poogt de Indo-Slavische en Indo-Iraanse taalgemeenschappen te plaatsen in de ruimte en de tijd. Er worden drie hypothetische verspreidingscenario's voorgesteld, waarvan de Touwbekercultuurhypothese het best klopt met de taalkundige, archeologische en genetische gegevens. Deze conclusie is gebaseerd op taalkundige overwegingen omtrent de Indo-Slavische en Indo-Iraanse woordenschat gerelateerd aan levenswijze, in vergelijking met de archeologische gegevens, evenals met het genetische bewijs voor continuïteit tussen Touwbekergroepen en Centraal- en Zuid-Aziatische bevolkingsgroepen.

Curriculum Vitae

Axel Ingemar Palmér was born on 14 October 1994 in Uppsala, Sweden. After attending secondary education with a focus on languages at Katedralskolan, he enrolled in the Bachelor's Programme in Languages at Uppsala University in 2013. After receiving his bachelor's degree in Indology and Indo-European linguistics, he moved to Leiden in 2017 to follow the Research Master programme in linguistics, from which he graduated (*summa cum laude*) in 2019. Later that year, he was awarded funding by the NWO under the scheme *Promoties in de Geesteswetenschappen* with a project on Indo-Iranian prehistory, which was concluded in 2024.

As part of the Indo-European language family, the Indo-Iranian branch traces its origins back to the Indo-European homeland on the Pontic-Caspian steppe 5000 years ago. But how did it spread from there to Asia? The aim of this thesis is to uncover the early prehistory of Indo-Iranian by investigating its relationship to the Balto-Slavic languages of Eastern Europe, which have been hypothesized to form a subgroup with Indo-Iranian: *Indo-Slavic*. By comparing the linguistic data with evidence from archaeology and genetics, this thesis traces the migration path of prehistoric Indo-Iranian speakers from the Pontic-Caspian steppe, via the rivers and forests of Eastern Europe, across the Ural Mountains, and southwards to the steppes of Central Asia.